

**U. S. NAVAL SUBMARINE
MEDICAL CENTER**

Submarine Base, Groton, Conn.

SPECIAL REPORT NO. 68-2

ANNUAL REPORT OF PROGRESS SUMMARIES

Research and Technology Resume

-- DD Form 1498 --

as of 31 December 1967

Approved and Released by:

**G. J. Duffner, CAPT MC USN
COMMANDING OFFICER
U.S. Naval Submarine Medical Center**

2 January 1968



SUBMARINE MEDICAL RESEARCH LABORATORY
Naval Submarine Base, Groton, Connecticut 06340

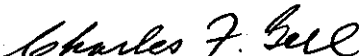
ANNUAL REPORT OF PROGRESS SUMMARIES

Research and Technology Resume

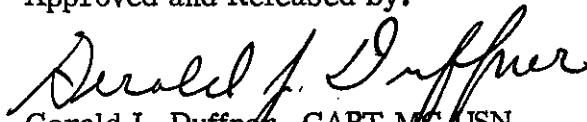
-- DD Form 1498 --

as of 31 December 1967

Reviewed and Approved by:


Charles F. Gell, M.D., D.Sc.
Scientific Director
SubMedResLab

Approved and Released by:


Gerald J. Duffner, CAPT MC USN
Commanding Officer
Submarine Medical Center

ANNUAL PROGRESS REPORT ON
WORK UNITS ASSIGNED
SUBMARINE MEDICAL RESEARCH LABORATORY

Research Area/Work Unit No.	Title:	Page
<u>Countermeasures, Shorebased:</u>		
MF011.99-9003	Physiological Effects of Long Duration Habitation in Hyperbaric Air and Artificial Environments	1
<u>Exploratory Development:</u>		
MF022.01.02-9004	Selection and Retention of Submarine and Diving Personnel.....	3
MF022.01.03-9006	Study of Human Factors and Their Relationship to Weapons System Effectiveness in Submarine and Antisubmarine Warfare	5
MF022.01.03-9007	Team Interaction in Man-Machine Systems	7
MF022.01.03-9008	Evaluation of Submarine Crew Member and Diver Proficiency.....	9
MF022.01.04-9003	Physiological Psychology of Special Senses Under Environmental Stress.....	11
MF022.01.04-9004	Optimizing of Special Senses in Submarine and Diving Operations.....	13
MF022.01.04-9005	Procedures for Improving Vision, Auditory Communication, and Orientation Under Water.....	15
MF022.01.04-9009	Psychophysiological Effects of Closed Habitat Stressors	17
MF022.03.03-9010	Computer Programming for Solution of Decompression Equations.....	19
MF022.03.03-9025	Assessment of Factors Related to Submarine Habitability, Escape and Rescue, and New Equipment	21
MF022.03.03-9027	Buoyant Free Escape	23
MF022.03.03-9028	Time-Concentration Exposure Limits of CO ₂	25
MF022.03.03-9029	Effect of Exposure to Total Atmospheric Environments in Submarines and of Individual Trace Substances in Respiratory Functions	27
MF022.03.03-9030	Effect of Isolation on Various Work-Rest Cycles on Rhythms of Physiological Functions and Performance...	29
<u>Biophysics:</u>		
MF022.03.08-9001	Biomedical Aspects of Naval LASER Applications ...	31

Research Area/Work Unit No.	Title	Page
<u>Biological and Medical Sciences:</u>		
<u>Biological Response to Environment:</u>		
MR005.04-0053	Enzymatic Responses to Environmental Challenges.....	33
MR005.04-0054	Physiological Alterations During Free Diving.....	35
MR005.04-0057	Minimal Recompression O ₂ Treatment for Decompression Sickness.....	37
MR005.04-0061	Physiological Significance and Tolerance Limits of Short and Prolonged Exposure to Increased Concentrations of Aerosols and Ions in the Atmosphere....	39
MR005.04-0062	Bone Changes in Diving Personnel Not Related to Clinical Decompression Sickness.....	41
MR005.04-0063	Excursion Dives from the Gas-Saturated State at Depth (Animals/Humans)	43
<u>Surgical Sciences:</u>		
MR005.19-6024	Effect of Stresses of Submarine Service on Oral Health.....	45
MR005.19-6025	Study of Oral Health in the Antarctic.....	47
MR005.19-6026	Clinical Evaluation of Stannous Fluoride in Preventive Dentistry	49
MR005.19-6027	Self-Applied SnF ₂ Prophylaxis Technique in Preventive Dentistry	51
MR005.19-6042	Study of Preventive Dental Principles and Methods in Military Populations	53
MR005.19-6054	Clinical Evaluation of Acidulated Phosphate Fluoride in Preventive Dentistry	55
<u>Breakdown:</u>		
Biophysics-----		1
Dental Branch-----		6
Human Factors Engineering Branch -		3
Military Operations Branch-----		4
Personnel Research Branch-----		3
Physiology Branch-----		8
Special Senses Branch -----		3
		28
Category 3 (reported separately)----		3
TOTAL		31

RESEARCH AND TECHNOLOGY RESUME		1.	2. GOVT ACCESSION	3. AGENCY ACCESSION	REPORT CONTROL SYMBOL DD-DR&E(AR)636
4. DATE OF RESUME 31 12 67	5. KIND OF RESUME D.Change 31 12 66	6. SECURITY RPT U WRK	7. REGRADING N/A	8. RELEASE LIMITATION GA	9. LEVEL OF RESUME A-Work Unit
10a. CURRENT NUMBER/CODE 62227012 MF011.99-9003		10b. PRIOR NUMBER/CODE Same			
11. TITLE: Physiological Effects of Long Duration Habitation in Hyperbaric Air and Artificial Environments					
12. SCIENTIFIC OR TECH. AREA 005900 Environmental biology		13. START DATE 22 09 49	14. CRIT. COMPL. DATE N/A	15. FUNDING AGENCY DNO 1	
16. PROCURE. METHOD C.In-House	17. CONTRACT/GRANT a. DATE: b. NUMBER: c. TYPE: N/A d. AMOUNT:	18. RESOURCES EST. a. PROFESSIONAL MAN-YEARS PRIOR FY '67 2.75 CURRENT FY '68 3		b. FUNDS (In thousands) 41 45	
19. GOV'T LAB/INSTALLATION/ACTIVITY NAME: Naval Submarine Medical Center ADDRESS: NavSubBase, Groton, Conn. 06340		20. PERFORMING ORGANIZATION NAME: Physiology Branch ADDRESS: Submarine Medical Research Lab. INVESTIGATORS: Markham, T.N., LCDR MC USN PRINCIPAL: Schaefer, K. E., M.D. ASSOCIATE: Autovon 746-3896 TELE: 203-449-3896 TYPE: DN			
21. TECHNOLOGY UTILIZATION Underwater physiology		22. COORDINATION N/A			
23. KEYWORDS (U) High ambient pressures; animal; human exposures; various breathing media; gas elimination					
24. (U) OBJECTIVE: To investigate physiological processes adaptive to various breathing media in high pressure environments to provide biomedical support of deep diving operations. (U) APPROACH: Studies of long-range physiological responses during prolonged exposure to high pressure environment using available telemetry equipment. (U) PROGRESS: During 12 days of exposure at 7 atm (200 feet) in 90% helium a temporary 5-day decrease in vital capacity was observed while maximum breathing capacity decreased 38% on the first day of compression without significant alterations during the subsequent exposure period. Under the same conditions, a 5-day stress response was found as indicated in increased blood corticosteroid levels. Moreover, all subjects exhibited an increase in alveolar CO ₂ tensions, pulmonary and urinary CO ₂ excretion during the 12-day exposure to high pressure environment.					
27. COMMUNICATIONS SECURITY <input type="checkbox"/> COMSEC OR COMSEC RELATED <input checked="" type="checkbox"/> NOT RELATED		28.	29. OSD CODE AR	30. BUDGET CODE 7	
31. MISSION OBJECTIVE GOR 43		32. PARTICIPATION			
33. REQUESTING AGENCY N/A		34. SPECIAL EQUIPMENT N/A			
35. EST. FUNDS (In thousands) CFY+1 N/A		36.			

DD FORM 1498

REPLACES EDITION OF 1 AUG 64 WHICH MAY BE USED.

(Items 1 to 26 identical to NASA Form 1122)

Addendum to Work Unit MF011.99.9003

1/67--12/67 - Publications

1. Lord, G. P., G. F. Bond, and K. E. Schaefer. Breathing under high ambient pressure. J. Appl. Physiol. V21(6):1833, November 1966. SMRL Reprint Report #491, 24 February 1967.
2. Schaefer, K. E. Metabolic effects during prolonged exposure to high pressure environment. Abstract. Fourth International Biometeorological Congress, New Brunswick, N. J., September 1966.

RESEARCH AND TECHNOLOGY RESUME				1.	2. GOVT ACCESSION	3. AGENCY ACCESSION	REPORT CONTROL SYMBOL DD-DR&E(AR)636
4. DATE OF RESUME 31 12 67	5. KIND OF RESUME D. Change (01 10 67)	6. SECURITY RPT U WRK	7. REGRADING N/A	8. RELEASE LIMITATION GA	9. LEVEL OF RESUME A. Work Unit		
10a. CURRENT NUMBER/CODE 62212012 MF022.01.02-9004				10b. PRIOR NUMBER/CODE 62212012 MF022.03.03-9021			
11. TITLE: (U) Selection and Retention of Submarine and Diving Personnel							
12. SCIENTIFIC OR TECH. AREA 012500 Personnel Selection; 012400 Personnel Selection(Med); 013400 Psychology(Ind & Grp)				13. START DATE 10 67	14. CRIT. COMPL. DATE N/A	15. FUNDING AGENCY DNO 1	
16. PROCURE. METHOD C. In-House		17. CONTRACT/GRANT a. DATE: b. NUMBER: N/A c. TYPE: d. AMOUNT:		18. RESOURCES EST. PRIOR FY 67 CURRENT FY 68		19. PROFESSIONAL MAN-YEARS 2 2.5	
20. GOV'T LAB/INSTALLATION/ACTIVITY NAME: Naval Submarine Medical Center ADDRESS: Naval Submarine Base Nlon, Groton, Conn. 06340 RESP. INDIV.: DUFFNER, G. J., CAPT, MC, USN TEL: 203-449-3261 AUTOVON: 746-3261		21. PERFORMING ORGANIZATION NAME: Personnel Research Branch ADDRESS: Submarine Medical Research Laboratory INVESTIGATORS: Weybrew, Benjamin B., Ph.D. PRINCIPAL: Hester, Rupert, Ph.D. ASSOCIATE: TEL: 203-449-3828 AUTO: 746-3828 TYPE: DN					
22. TECHNOLOGY UTILIZATION Personnel Psychology				23. COORDINATION N/A			
24. KEYWORDS (U) Submariner Selection (Medical and Psychological); Computer technology (Honeywell 800); Statistical methodology; Psychiatric Screening. Aquanaut selection.							
25. (U) TECHNICAL OBJECTIVE: Development and validation of the most efficacious methods of selecting and/or screening of officer and enlisted candidates for the submarine service and for duty as divers, Escape Tank Instructors and Sea Lab subjects. The emphasis is upon the identification of those characteristics associated with career submariners and divers. An additional objective is the development of mathematical models as well as computer strategies applicable to these kind of data.							
26. (U) APPROACH: Using several multivariate approaches implementable by existing computer programs, aptitude, biographic, demographic, personality and psychiatric measures are integrated in order to disclose the most effective method of identifying the marginally adjusted candidates for the submarine service. Similar approaches are implemented to identify and weight those biomedical and psychological factors characterizing the effective diver and aquanaut. Computer programs applicable to these multivariate models are developed as needed.							
27. (U) PROGRESS: Thirty publications (from MF022.03.03-9021 and ...-9022) now in the professional literature provide the background for this Work Unit (start date October 1967). Progress during this reporting period is along four lines: (1) a "custom-tailored" biographical inventory has been partially validated for enlisted submariners; (2) the data collection phases for three criterion-related studies have been completed, one associated with enlisted qualification, one involving officer retention and the other pertaining to officer leadership; (3) a search of the literature pertaining to various aspects of the diver and aquanaut programs nears 50% completion; and (4) a Navy-wide Workshop on Personnel Selection was conducted. The proceedings of this meeting are being prepared for publication.							
27. COMMUNICATIONS SECURITY <input type="checkbox"/> a. COMSEC OR COMSEC RELATED <input checked="" type="checkbox"/> b. NOT RELATED		28.		29. OSD CODE DT		30. BUDGET CODE 1	
31. MISSION OBJECTIVE GOR 43				32. PARTICIPATION			
33. REQUESTING AGENCY N/A		34. SPECIAL EQUIPMENT N/A					
35. EST. FUNDS (In thousands) N/A		36.					
CFY+1 N/A							

DD FORM 1498

REPLACES EDITION OF 1 AUG 64 WHICH MAY BE USED.

(Items 1 to 26 identical to NASA Form 1122)

Addendum to Work Unit MF022.01.02-9004

1/67 - 12/67 Publications

Earls, J. H. & Hester, R. Tattooed Sailors. Some Sociopsychological Correlates. Military Medicine 132 (No. 1) Jan. 1967.

Inman, E. E. Personality Assessment through Utilization of Response Set. J. Gen. Psychol. Sep. 1967.

RESEARCH AND TECHNOLOGY RESUME		1.	2. GOVT ACCESSION	3. AGENCY ACCESSION	REPORT CONTROL SYMBOL DD-DR&E(AR)636
4. DATE OF RESUME 31 12 67	5. KIND OF RESUME D. Change 18 04 67	6. SECURITY U NPT C WK	7. REGRADING N/A	8. RELEASE LIMITATION GA	9. LEVEL OF RESUME A. Work Unit
10a. CURRENT NUMBER/CODE 6221201N MFO22.01.03 - 9006		10b. PRIOR NUMBER/CODE None			
11. TITLE: A Study of Human Factors and Their Relationships to Weapon-System Effectiveness in Submarine and Anti-Submarine Warfare					
12. SCIENTIFIC OR TECH. AREA 013400 Psychology; 007500 HFE; 009400 M/m relations		13. START DATE 07 67	14. CRIT. COMPL. DATE N/A	15. FUNDING AGENCY DNO	
16. PROCURE. METHOD C. In-house	17. CONTRACT/GRANT a. DATE: b. NUMBER: N/A c. TYPE: d. AMOUNT:	18. RESOURCES EST. PRIOR FY 67 CURRENT FY 68	19. PROFESSIONAL MAN-YEARS 6 6	20. FUNDS (In thousands) 60 69	
19. GOV'T LAB/INSTALLATION/ACTIVITY NAME: Naval Submarine Medical Center ADDRESS: NavSubBase, Groton, Conn. 06340		20. PERFORMING ORGANIZATION NAME: Human Factors Branch ADDRESS: Submarine Medical Research Laboratory			
RESP. INDIV.: DUFFNER, Gerald J., CAPT, MC, USN TEL: 203-449-3261 AUTOVON 746-3261		INVESTIGATOR: Moeller, Dr. George PRINCIPAL: Ryack, Dr. Bernard L. ASSOCIATE: TEL: 203-449-3668; 746-3668 TYPE: DN			
21. TECHNOLOGY UTILIZATION Performance Standards		22. COORDINATION N/A			
23. KEYWORDS (U) Proficiency measures; weapon system effectiveness; Human Factors; Training technology; Performance standards					
24. (U) <u>OBJECTIVE</u> : To increase the efficiency of the weapon system complex of SSK submersibles. The objective of the present investigation is to (1) develop and evaluate techniques for measurement of crew performance in ASW operations; (2) collect normative data for assessment of crew readiness for ASW operations; (3) identify major sources of crew variability in attack center operation related to organization, training, and equipment design; and (4) recommend evaluated changes in organization, training, and equipment design.					
25. (U) <u>APPROACH</u> : The project will be conducted in the following phases (1) Evaluation of existing systems through simulation and on-board study with reference to--communication links, nature of information inputs and outputs, information processing requirements, sources of error in information processing and transmission, and establishment of criteria of effective performance; (2) Continuation of the preceding with emphasis on--group processes, decision making, risk taking, and personnel related variables; (3) Model building and laboratory evaluation of hypotheses developed through simulation; (4) Simulation to test new techniques, additional laboratory studies to be conducted simultaneously, as required; and (5) Final validation data collected at sea during ASW exercises, and development of specific recommendations for reduction of training requirements through task reorganization and improvement of training.					
26. (U) <u>PROGRESS</u> : The major portion of data collection in Phase I has been completed. An interim report summarizing findings to date and outlining steps required to complete this work unit is in preparation.					
27. COMMUNICATIONS SECURITY <input type="checkbox"/> a. COMSEC OR COMSEC RELATED <input checked="" type="checkbox"/> b. NOT RELATED		28.	29. OSD CODE AR	30. BUDGET CODE 1	
31. MISSION OBJECTIVE GOR 43		32. PARTICIPATION DN CNO \$69,716			
33. REQUESTING AGENCY N/A		34. SPECIAL EQUIPMENT N/A			
35. EST. FUNDS (In thousands) N/A		36.			

DD FORM 1498

REPLACES EDITION OF 1 AUG 64 WHICH MAY BE USED.

(Items 1 to 26 identical to NASA Form 1122)

Addendum to Work Unit MF022.01.03 - 9006
1/67 - 12/67 Publications

Ryack, B. and Moeller, G. Experimental Design for Collection of Baseline Data on the MK113, Mod 5 Fire Control System and Summary of Research Program (U). CONF (Working paper, WSB program)

RESEARCH AND TECHNOLOGY RESUME		1.	2. GOVT ACCESSION	3. AGENCY ACCESSION	REPORT CONTROL SYMBOL DD-DR&E(AR)636
4. DATE OF RESUME 31 12 67	5. KIND OF RESUME D. Change 31 12 66	6. SECURITY U	7. REGRADING N/A	8. RELEASE LIMITATION GA	9. LEVEL OF RESUME A. Work Unit
10a. CURRENT NUMBER/CODE 6221201N MPO22.01.03 - 9007			10b. PRIOR NUMBER/CODE 62212012 MPO22.03.03 - 9014		
11. TITLE: (U) Team Interaction in Man-Machine Systems					
12. SCIENTIFIC OR TECH. AREA 013400 Psychology 009400 M/m relations; 007500 HFE			13. START DATE 01 01 64	14. CRIT. COMPL. DATE N/A	15. FUNDING AGENCY DNO
16. PROCURE. METHOD C. In-house	17. CONTRACT/GRANT a. DATE: b. NUMBER: N/A c. TYPE: d. AMOUNT:		18. RESOURCES EST. PRIOR FY 67 CURRENT FY 68	a. PROFESSIONAL MAN-YEARS 4 4	b. FUNDS (In thousands) 50 50
19. GOV'T LAB/INSTALLATION/ACTIVITY NAME: ADDRESS: Naval Submarine Medical Center NavSubBase, Groton, Conn. 06340			20. PERFORMING ORGANIZATION NAME: ADDRESS: Human Factors Branch Submarine Medical Research Laboratory		
RESP. INDIV.: DUFFNER Gerald J., CAPT, MC, USN TEL: 203-449-3261 AUTOVON 746-3261			INVESTIGATORS PRINCIPAL: Moeller, Dr. George ASSOCIATE: Ryack, Dr. Bernard L. TEL: 203-449-3668; 746-3668 TYPE: DN		
21. TECHNOLOGY UTILIZATION Human Engineering; man/ machine; personnel management work			22. COORDINATION N/A		
23. KEYWORDS (U) Team interaction; organization and assignment of tasks; training technique; group interaction models					
24. (U) OBJECTIVE: To provide data to guide organization and assignment of tasks, and to aid the development of training techniques for men assigned to such tasks. Research attempts to provide information on the way small groups function, and on the variables which control individual performance as members of a task group.					
25. (U) APPROACH: Studies are conducted of individual and group performance in a variety of tasks. Comparison of performance of individuals and groups directly and via models of group interaction are used to elucidate the factors affecting groups of performance.					
26. (U) PROGRESS: To update available bibliographies, a survey of the recent literature (1959 to present) on group and individual performance was undertaken. Processing of data on hand is in progress. A new procedure for recording and classifying observations of interpersonal communications in a simulated operational system was developed. Evaluation of this procedure is in progress.					
27. COMMUNICATIONS SECURITY <input type="checkbox"/> a. CONSEC OR CONSEC RELATED <input checked="" type="checkbox"/> b. NOT RELATED		28.	29. OSD CODE DT	30. BUDGET CODE 1	
31. MISSION OBJECTIVE GOR 43			32. PARTICIPATION N/A		
33. REQUESTING AGENCY N/A		34. SPECIAL EQUIPMENT N/A			
35. EST. FUNDS (In thousands) N/A		36.			

DD FORM 1498
1 NOV 65

REPLACES EDITION OF 1 AUG 64 WHICH MAY BE USED.

(Items 1 to 26 identical to NASA Form 1122)

Addendum to Work Unit MF022.01.03-9007

1/67-12/67 Publications:

None.

RESEARCH AND TECHNOLOGY RESUME		1.	2. GOVT ACCESSION	3. AGENCY ACCESSION	REPORT CONTROL SYMBOL DD-DR&E(AR)636
4. DATE OF RESUME 31 12 67	5. KIND OF RESUME D. Change (01 10 67)	6. SECURITY RPT U WRK	7. REGRADING N/A	8. RELEASE LIMITATION GA	9. LEVEL OF RESUME A. Work Unit
10a. CURRENT NUMBER/CODE 62212012 MF022.01.03-9008			10b. PRIOR NUMBER/CODE 62212012 MF022.03.03-9024		
11. TITLE: (U) Evaluation of Submarine Crew Member and Diver Proficiency					
12. SCIENTIFIC OR TECH. AREA 009400 Man-machine relations; 013400 Psych (Ind&Grp) 009700 Mathematics & Statistics			13. START DATE 10 67	14. CRIT. COMPL. DATE N/A	15. FUNDING AGENCY DNO
16. PROCURE. METHOD C. In-House	17. CONTRACT/GRANT a. DATE: b. NUMBER: N/A c. TYPE:		18. RESOURCES EST. PRIOR FY 67 CURRENT FY 68	a. PROFESSIONAL MAN-YEARS 2.0 2.0	b. FUNDS (In thousands) 22 22
19. GOV'T LAB/INSTALLATION/ACTIVITY NAME: Naval Submarine Medical Center ADDRESS: Naval SuBase NLon, Groton, Conn. 06340			20. PERFORMING ORGANIZATION NAME: Personnel Research Branch ADDRESS: Submarine Medical Research Laboratory		
RESP. INDIV.: DUFFNER, G. J., CAPT, MC, USN TEL: 203-449-3261 AUTOVON: 746-3261			INVESTIGATORS PRINCIPAL: Hester, Ruport, Ph.D. ASSOCIATE: Weybrew, Benjamin B., Ph.D. TEL: 203-449-3828 AUTO: 746-3828 TYPE: DN		
21. TECHNOLOGY UTILIZATION Systems Analysis			22. COORDINATION		
23. KEYWORDS (U) Criterion development; Mathematical models, Man-machine systems; Psychopathology					
24. (U) TECHNICAL OBJECTIVE: To identify and evaluate the major factors affecting the proficiency and adjustment of the submariner as an integral part of the submarine viewed as a complex weapons system. An additional goal is to examine different techniques of proficiency and adjustment criterion development by use of mathematical modeling and simulation approaches.					
25. (U) APPROACH: The program of this unit is to study submariner and diver proficiency, used broadly to include individual and team performance as well as assessment of the men's psychiatric status as indicated. Where applicable, systems analytical techniques are used to investigate the performance effectiveness of the man interacting with the complex machine. In some instances, descriptive and/or formal mathematical models are constructed. A variety of psychometric and clinical psychiatric techniques are used to delineate the etiological factors for psychopathology occurring under submerged conditions.					
26. (U) PROGRESS: Seven publications (from MF022.03.03-9024) provide the background for this Work Unit (start date Oct 1967). During this reporting period, the focus has been in three, somewhat overlapping, directions: (1) a search for the major factors accounting for individual differences in the quality of a submariner's adjustment (both officers and enlisted men) to submerged conditions; (2) an examination of the background and personality differences of Submarine Medical Officers as compared to a matched group of non-submarine Medical Officers; and (3) the development of mathematical models relating criteria of weapons systems functions to crew performance within the same system.					
27. COMMUNICATIONS SECURITY <input type="checkbox"/> a. COMSEC OR COMSEC RELATED <input type="checkbox"/> b. NOT RELATED		28.	29. OSD CODE DT	30. BUDGET CODE 1	
31. MISSION OBJECTIVE GOR 43			32. PARTICIPATION		
33. REQUESTING AGENCY N/A		34. SPECIAL EQUIPMENT N/A			
35. EST. FUNDS (In thousands) N/A		36.			

DD FORM 1498
1 NOV 65

REPLACES EDITION OF 1 AUG 64 WHICH MAY BE USED.

(Items 1 to 26 identical to NASA Form 1122)

Addendum to Work Unit MF022.01.03-9008

1/67-12/67 Publications:

Klagsbrun, S. C. In Search of an Identity. Archives of Psychiatry.
March 16, 1967, 286-289.

Satloff, A. Psychiatry and the Nuclear Submarine. Amer. J. Psychiat.
Oct. 1967.

RESEARCH AND TECHNOLOGY RESUME				2. GOVT ACCESSION		3. AGENCY ACCESSION		REPORT CONTROL SYMBOL DD-DR&E(AR)636	
4. DATE OF RESUME 31 12 67		5. KIND OF RESUME D. Change 22-3-67		6. SECURITY RPT U WRK		7. REGRADING N/A		8. RELEASE LIMITATION GA	
106. CURRENT NUMBER/CODE 62212012 MF 022.01.04-9003				105. PRIOR NUMBER/CODE N/A					
11. TITLE: (U) Physiological Psychology of Special Senses Under Environmental Stress									
12. SCIENTIFIC OR TECH. AREA 007900 Industrial Medicine 016200 Stress Physiology				13. START DATE 03-67		14. CRIT. COMPL. DATE N/A		15. FUNDING AGENCY DN Other	
16. PROCURE. METHOD C. In-House		17. CONTRACT/GRANT a. DATE: b. NUMBER: N/A c. TYPE: d. AMOUNT:		18. RESOURCES EST. PRIOR FY 67 CURRENT FY 68		a. PROFESSIONAL MAN-YEARS 3 3		b. FUNDS (In thousands) 54 54	
19. GOV'T LAB/INSTALLATION/ACTIVITY NAME: Naval Submarine Medical Center ADDRESS: Naval Submarine Base New London Groton, Connecticut 06340 RESP. INDIV.: DUFFNER, G.J., CAPT MC USN TEL: 203 449-3261 Autovon 746-3261				20. PERFORMING ORGANIZATION NAME: Special Senses Branch ADDRESS: Submarine Medical Research Lab. INVESTIGATORS PRINCIPAL: Smith, Mr. Paul F. ASSOCIATE: Weitzman, Dr. Donald TEL: 203 449-3201 Auto 746-3201 TYPE: DN					
21. TECHNOLOGY UTILIZATION Industrial Medicine				22. COORDINATION N/A					
23. KEYWORDS (U) Visual orientation and distortion, proprioception and vestibular sensitivity auditory sensitivity, acoustic trauma, underwater hearing.									
24. (U) <u>OBJECTIVE</u> : The purpose of this work is to examine significant changes in the Special Senses (Visual, auditory, kinesthetic and vestibular sensitivity) observed under conditions of acute environmental stresses (deep diving physiological stresses) and to develop stress-sensitive tests for predicting performance in undersea tasks. Numerous studies have demonstrated that exposures to physiological stresses similar to those expected to be encountered in underwater environments produce marked alterations in the functioning of the special senses and must therefore be studied in order to maximize both the safety and performance of men working in the sea.									
25. (U) <u>APPROACH</u> : Physiological change associated with unusual environments as the atmosphere breathed, pressure, cold, fatigue, etc., will be measured by: 1) physiological measures of the eye such as retinal photographs and intraocular pressure, 2) sensitive changes in auditory sensitivity. Significant changes occurring under any environmental stress will be measured in submarines, pressure chambers and underwater with an eye to determining which sensory tests can be used as reliable indicators of physiological stress and as a warning of more serious disability to come.									
26. (U) <u>PROGRESS</u> : A visual test battery has been selected and calibrated for use in the pressure chamber and for assessing the effects of CO2 on visual performance. Data has been obtained on the effects of AN/SQS-26 sonar transmissions on free swimming divers. Appropriate safety standards have been proposed to COMNAVSHIPSYSYSCOM. Underwater threshold data have been obtained. Two reports on "Underwater Hearing in Man" are in preparation.									
27. COMMUNICATIONS SECURITY <input type="checkbox"/> a. COMSEC OR COMSEC RELATED <input checked="" type="checkbox"/> b. NOT RELATED		28.		29. OSD CODE AR		30. BUDGET CODE 1			
31. MISSION OBJECTIVE GOR 43				32. PARTICIPATION DN Naval Underwater Sound Lab \$18,000.					
33. REQUESTING AGENCY N/A		34. SPECIAL EQUIPMENT N/A							
35. EST. FUNDS (In thousands) CPY+1 N/A		36.							

DD FORM 1 NOV 65 1498

REPLACES EDITION OF 1 AUG 64 WHICH MAY BE USED.

(Items 1 to 26 identical to NASA Form 1122)

Addendum to Work Unit MF022.01.04-9003

1/67-12/67 Publications:

None.

RESEARCH AND TECHNOLOGY RESUME				1.	2. GOVT ACCESSION	3. AGENCY ACCESSION	REPORT CONTROL SYMBOL DD-DR&E(AR)636
4. DATE OF RESUME 31 12 67	5. KIND OF RESUME D. Change 4-1-67	6. SECURITY RPT U WRK	7. REGRADING N/A	8. RELEASE LIMITATION GA	9. LEVEL OF RESUME A. Work Unit		
109. CURRENT NUMBER/CODE 62212012 MF 022.01.04-9004				108. PRIOR NUMBER/CODE N/A			
11. TITLE: (U) Optimization of Special Senses in Submarine and Diving Operations							
12. SCIENTIFIC OR TECH. AREA 009400 Man-Mach Rel. 012500 Pers. Sel Tr&Eval 013400 Psychol.				13. START DATE 04 01 67	14. CRIT. COMPL. DATE N/A	15. FUNDING AGENCY DN Other	
16. PROCEDURE METHOD C. In-House	17. CONTRACT/GRANT a. DATE: b. NUMBER: N/A c. TYPE: d. AMOUNT:			18. RESOURCES EST. PRIOR FY 67 CURRENT FY 68	a. PROFESSIONAL MAN-YEARS 2.75 3.		b. FUNDS (In thousands) 41 42
19. GOV'T LAB/INSTALLATION/ACTIVITY NAME: ADDRESS: Naval Submarine Medical Center Naval Submarine Base New London Groton, Connecticut 06340 RESP. INDIV.: DUFFNER, G.J., CAPT MC USN TEL: 203 449-3261 Autovon 746-3261				20. PERFORMING ORGANIZATION NAME: ADDRESS: Special Senses Branch Submarine Medical Research Lab. INVESTIGATORS PRINCIPAL: Kinney, Dr. JoAnn S. ASSOCIATE: TEL: 203 449-3867 Auto 746-3867 TYPE: DN			
21. TECHNOLOGY UTILIZATION Human Factors Engineering				22. COORDINATION N/A			
23. KEYWORDS (U) Audition, vision, monitoring, vigilance, detection, safety, selection.							
24. (U) OBJECTIVE: To ensure (1) that various sensory abilities required in the operation of a submarine or in diving are fully utilized for optimum human performance, (2) that technical means of presenting information are consistent with physiological limitations and capabilities of the human sensor, and (3) that the environmental limits conducive to safety for the senses are set and not exceeded.							
25. (U) APPROACH: Existing conditions aboard submarines are surveyed and evaluated with respect to human perceptual capacity. Behavior is measured in monitoring situations; reasons for detection failures and performance decrements are sought in order to provide remedies or training procedures to eliminate human error. Safety standards are assessed and recommendations for improvement made. Selection standards are continually reevaluated with respect to operational needs and conditions.							
26. (U) PROGRESS: Inspection tours of aircraft carriers and "Underway Night Replenishment" Supply ships were carried out. Analyses of night lighting, problems on aircraft hanger and flight decks, of lighting requirements for fork lifts, and of UNREP night operations have been written. Study of ocular fatigue, discomfort or pain due to use of electro-optical aids is underway. Apparatus and procedure for experiments on visual search and display monitoring are completed. Studies were completed or under way on high-frequency audiometry, tonal masking of sonar signals, noisy radio code, localizing sounds in space, and sonar operator selection and vigilance. There are four reports in preparation.							
27. COMMUNICATIONS SECURITY <input type="checkbox"/> a. CONSEC OR CONSEC RELATED <input checked="" type="checkbox"/> b. NOT RELATED		28.		29. OSD CODE AR		30. BUDGET CODE 1	
31. MISSION OBJECTIVE GOR 43				32. PARTICIPATION DN NSL & DC \$5,000			
33. REQUESTING AGENCY N/A		34. SPECIAL EQUIPMENT N/A					
35. EST. FUNDS (In thousands) CFY+1 N/A		36.					

DD FORM 1 NOV 65 1498

REPLACES EDITION OF 1 AUG 64 WHICH MAY BE USED.

(Items 1 to 26 identical to NASA Form 1122).

Addendum to Work Unit MF 022.01.04-9004

1/67 - 12/67 Publications

Luria, S.M. Effect of width of movement of a masking stimulus at constant target separation. J. Opt. Soc. Am. 57, 273-275, Feb 1967. NSMC Memo Rep. 67-3, 11 Apr 1967

Luria, S.M. Color-name as a function of stimulus-intensity and duration. Am. J. Psychol. 80, 14-27, Mar 67. NSMC 494 of 1 May 1967.

Kinney, Jo Ann S. Color induction using asynchronous flashes. Vision Res. 7, 299-318, Mar 1967. NSMC 496 of 26 May 1967.

Kinney, Jo Ann S. Degree of applicability and consequences of inappropriate use of units of light. Applied Optics, 6, 1473-1477, 1967.

Weitzman, D.O. and Jo Ann S. Kinney. Appearance of color for small, brief, spectral stimuli in the central fovea. J. Opt. Soc. Am. 57, 665-670, 1967. NSMC 502, 23 Oct 67.

Booker, R.L. and Luria, S.M. Aircraft carrier hangar deck lighting. Phase I. ANNADIV NAVSHIPRANDCEN Report 2446, Oct 1967.

Kinney, Jo Ann S. Induced colors seen by a deuteranope. J. Opt. Soc. Am. 57, 1149-1154, 1967.

Myers, C.K. An evaluation for use in audiometry of the noise attenuation of three types of circumaural earmuffs. SMRL Memo Rep. 67-1, of 23 Jan 67.

RESEARCH AND TECHNOLOGY RESUME				1.	2. GOVT ACCESSION	3. AGENCY ACCESSION	REPORT CONTROL SYMBOL DD-DR&E(AR)636
4. DATE OF RESUME 31 12 67	5. KIND OF RESUME D. Change 31 12 66	6. SECURITY RPT U WRK	7. REGRADING N/A	8. RELEASE LIMITATION GA	9. LEVEL OF RESUME A-Work Unit		
10a. CURRENT NUMBER/CODE 62212012 MF 022.01.04-9005				10b. PRIOR NUMBER/CODE N/A			
11. TITLE: (U) Procedures for Improving Vision, Auditory Communications, and Orientation. Under Water							
12. SCIENTIFIC OR TECH. AREA 013400 Psychology 008800 Lift Support				13. START DATE 03-67	14. CRIT. COMPL. DATE N/A	15. FUNDING AGENCY DN Other	
16. PROCURE. METHOD C. In-House	17. CONTRACT/GRANT a. DATE: b. NUMBER: N/A c. TYPE: d. AMOUNT:	18. RESOURCES EST. PRIOR FY 67 CURRENT FY 68		a. PROFESSIONAL MAN-YEARS 3 3		b. FUNDS (In thousands) 60 60	
19. GOV'T LAB/INSTALLATION/ACTIVITY NAME: ADDRESS: Naval Submarine Medical Center Naval Submarine Base New London Groton, Connecticut 06340 RESP. INDIV.: DUFFNER, G.J., CAPT MC USN TEL: 203 449-3261 Autovon 746-3261				20. PERFORMING ORGANIZATION NAME: ADDRESS: Special Senses Branch Submarine Medical Research Lab. INVESTIGATORS PRINCIPAL: Sergeant, Dr. Russell L. ASSOCIATE: Luria, Dr. Saul M. TEL: 203 449-3201 Auto 746-3201 PR: DN			
21. TECHNOLOGY UTILIZATION Undersea Behavioral Systems				22. COORDINATION N/A			
23. KEYWORDS (U) Underwater vision, verbal communication, audition and orientation; deep submergence & habitation; visibility; helium speech; fluorescent paint							
24. (U) <u>OBJECTIVE</u> : To devise methods of improving the abilities of divers to function underwater, to optimize sensory performance, ability to orient themselves and communicate with each other and with the surface; to explore methods of improving skills and equipment necessary for undersea performance.							
25. (U) <u>APPROACH</u> : Physical stimuli transmitted through water rather than air are distorted. This work-unit aims to identify resulting problems and measure any impairment of the senses underwater. The means of solving sensory problems will be sought and criteria for optimal use of the senses developed. Studies of underwater hearing and vision, analyses of helium speech and surveys of underwater communication systems will be done and calibration techniques developed.							
26. (U) <u>PROGRESS</u> : Visibility of various colors has been measured in water of various clarities under natural light and recommendations for visibility and camouflage made. Work is being extended to artificial underwater light sources. Estimates of size and distance and stereoscopic acuity have been studied underwater and compared with performance in air. Work is continuing on adaptation to underwater vision. Underwater hearing thresholds, helium speech and pressure-chamber noise have been studied and calibration techniques for underwater sensory studies developed. A program to study underwater verbal communication has been organized and we are helping USN USL to develop an underwater communication system.							
27. COMMUNICATIONS SECURITY <input type="checkbox"/> a. COMSEC OR COMSEC RELATED <input checked="" type="checkbox"/> b. NOT RELATED		28.	29. OSD CODE DT		30. BUDGET CODE 1		
31. MISSION OBJECTIVE GOR 43			32. PARTICIPATION DN USN USL \$12,200.				
33. REQUESTING AGENCY N/A		34. SPECIAL EQUIPMENT N/A					
35. EST. FUNDS (In thousands) CFY: N/A		36.					

DD FORM 1498

1 NOV 65

REPLACES EDITION OF 1 AUG 64 WHICH MAY BE USED.

(Items 1 to 26 identical to NASA Form 1122)

Addendum to Work Unit MF 022.01.04-9005

1/67 - 12/67 Publications

Kent, P. R. Vision Underwater. Am. J. Optom. & Arch. Am. Acad. Optom. 43, 553-565, Sep 1966. NSMC 498 of 22 Jul 67.

Kinney, Jo Ann S., and J. C. Cooper. Adaptation to a homochromatic visual world. NSMC 499, 28 Jul 67.

Luria, S. M., J.A.S. Kinney and S. Weissman. Estimates of size and distance underwater. Am. J. Psychol. LXXX #2, 282-286, June 1967.

Luria, S.M., J.A.S. Kinney and S. Weissman. Distance estimates with "filled" and "unfilled" space. Percept. Mot. Skills, 24, 1007-1010, Jun 67.

Kinney, J.A.S., S. M. Luria, and D.O. Weitzman. Visibility of colors underwater. J. Opt. Soc. Am. 57, 802-809, 1967. NSMC 503 of 23 Oct 67.

Sergeant, R.L. Phonemic Analysis of Consonants in Helium Speech. J. Acoust. Soc. Amer., 41, 66-69, Jan 1967.

Smith, P. F. Underwater test facilities for sensory research: A report of an exploratory conference. NSMC Special Report 67-5, 19 Apr 67.

RESEARCH AND TECHNOLOGY RESUME		1.	2. GOVT ACCESSION	3. AGENCY ACCESSION	REPORT CONTROL SYMBOL DD-DR&E(AR)636
4. DATE OF RESUME 31 12 67	5. KIND OF RESUME D. Change (01 10 67)	6. SECURITY RPT U WRK	7. REGRADING N/A	8. RELEASE LIMITATION GA	9. LEVEL OF RESUME A. Work Unit
10a. CURRENT NUMBER/CODE 62212012 MF022.01.04-9009		10b. PRIOR NUMBER/CODE 62212012 MF022.03.03-9023			
11. TITLE: (U) Psychophysiological Effects of Closed Habitat Stressors					
12. SCIENTIFIC OR TECH. AREA 006000 Escape, rescue & survival; 016200 Stress physiol; 012400 Para Sel (Med)		13. START DATE 10 67	14. CRIT. COMPL. DATE N/A	15. FUNDING AGENCY DNO 1	
16. PROCURE. METHOD C. In-House	17. CONTRACT/GRANT a. NUMBER: N/A c. TYPE:	18. RESOURCES EST. PRIOR FY 67 CURRENT FY 68	a. PROFESSIONAL MAN-YEARS 1 1.5	b. FUNDS (In thousands) 19 30	
19. GOV'T LAB/INSTALLATION/ACTIVITY NAME: Naval Submarine Medical Center ADDRESS: Naval SuBase Nlon, Groton, Conn.06340		20. PERFORMING ORGANIZATION NAME: Personnel Research Branch ADDRESS: Submarine Medical Research Laboratory INVESTIGATORS Weybrew, Benjamin B., Ph.D. PRINCIPAL: Parker, James W., M. S. ASSOCIATE: TEL: 203-449-3828 AUTO: 746-3828 TYPE: DN			
RESP. INDIV.: DUFFNER, G. J., CAPT, MC, USN TEL: 203-449-3261 AUTOVON: 746-3261					
21. TECHNOLOGY UTILIZATION Psychophysiology of Stress Adjustment		22. COORDINATION N/A			
23. KEYWORDS (U) Cognitive processes, Vigilance, Performance decrements to hyperbaric conditions, Response Analysis Tester and Logical Inference Tester					
24. (U) <u>TECHNICAL OBJECTIVE</u> : To conduct laboratory and operational studies designed to: (1) identify the major stressors found in the submarine environment; (2) to delineate the processes accounting for differences in stress tolerance; (3) to ascertain the effects of stress upon perceptual, emotional and performance processes; and (4) to develop methods of preventing or alleviating acute stress reactions. (U) <u>APPROACH</u> : The classes of submarine stressors focused upon are confinement, monotony, high ambient pressure and exotic gaseous conditions and "paced learning". Polygraphically recorded patterns of change in indices of autonomic nervous system functions are assumed to be one usefully valid class of predictors of stress tolerance. Laboratory studies involving electroencephalographic tracings (and other measures) and using Escape Tank Instructors and Submarine School candidates as subjects are conducted in the decompression chambers and other spaces provided. Operational studies are also conducted during prolonged submergence, the emphasis being more upon symptomatology rather than bioelectric indices. (U) <u>PROGRESS</u> : Nineteen publications (from MF022.03.03-9023) provide the background for this unit (start date Oct 1967). The immediate focus is upon the broad problem area of the effects of stress upon problem solving abilities and upon sustained vigilance, the instrumentation to test the former being LOGIT (Logical Inference Tester) and to test the latter being RATER (Response Analysis Tester). Decrements in indicants of the effects of stress, at present imposed pacing and distraction stress. Completed during this reporting period are two studies involving LOGIT and RATER and designed to provide base-line information for future studies aimed at the assessment of the behavioral effects of prolonged exposure to hyperbaric and exotic gaseous conditions.					
27. COMMUNICATIONS SECURITY <input type="checkbox"/> COMSEC OR COMSEC RELATED <input checked="" type="checkbox"/> NOT RELATED		28. N/A	29. OSD CODE DT	30. BUDGET CODE 1	
31. MISSION OBJECTIVE GOR 43		32. PARTICIPATION			
33. REQUESTING AGENCY N/A		34. SPECIAL EQUIPMENT N/A			
35. EST. FUNDS (In thousands) N/A		36.			

DD FORM 1498
1 NOV 65

REPLACES EDITION OF 1 AUG 64 WHICH MAY BE USED.

(Items 1 to 26 identical to NASA Form 1122).

Addendum to Work Unit MF022.01.04-9009

1/67 - 12/67 Publications:

Parker, J. W. The Response Analysis Tester (RATER) and Logical Inference Tester (LOGIT): I. Some preliminary findings. USN SubMedCen Report 487, Feb 1967.

Weybrew, B. B. & Stark, J. E. Psychological and Physiological Changes Associated with Deprivation from Smoking. USN SubMedCen Report 490, 23 Feb 1967.

RESEARCH AND TECHNOLOGY RESUME		1.	2. GOVT ACCESSION	3. AGENCY ACCESSION	REPORT CONTROL SYMBOL DD-DR&E(AR)636
4. DATE OF RESUME 31 12 67	5. KIND OF RESUME D. Change 31 12 66	6. SECURITY RU WK	7. REGRADING N/A	8. RELEASE LIMITATION GA	9. LEVEL OF RESUME A. Work Unit
10a. CURRENT NUMBER/CODE 62212012 MF022.03.03 - 9010			10b. PRIOR NUMBER/CODE 61245012 MR005.04 - 0056		
11. TITLE: (U) Computer Programming for Solution of Decompression Equations					
12. SCIENTIFIC OR TECH. AREA 016800 Toxicology			13. START DATE 01 64	14. CRIT. COMPL. DATE N/A	15. FUNDING AGENCY DNO 1
16. PROCURE. METHOD C. In-house	17. CONTRACT/GRANT a. DATE: b. NUMBER: c. TYPE:	18. RESOURCES EST. a. PROFESSIONAL MAN-YEARS PRIOR FY CURRENT FY		b. FUNDS (In thousands) 1 3	
19. GOV'T LAB/INSTALLATION/ACTIVITY NAME: ADDRESS: Naval Submarine Medical Center NavSubBase, Groton, Conn. 06340		20. PERFORMING ORGANIZATION NAME: ADDRESS: Human Factors Branch Submarine Medical Research Laboratory			
RESP. INDIV.: DUFFNER, Gerald J., CAPT, MC, USN TEL: 203-449-3261 AUTOVON 746-3261		INVESTIGATOR: Moeller, Dr. George PRINCIPAL ASSOCIATE: TEL: 203-449-3668: 746-3668 TYPE: DN			
21. TECHNOLOGY UTILIZATION Diving Treatment of Decompression Sickness			22. COORDINATION N/A		
23. KEYWORDS (U) Decompression equations; computer program(ming); diving tables; decompression experimental dives; HDU; test dives; continuous ascent; "stop" ascents					
24. (U) OBJECTIVE: Development and use of computer programs for solution of <u>decompression equations</u> . Programs are used to evaluate, or plan specific dives, and to prepare <u>diving tables</u> .					
25. (U) APPROACH: Programs are written with sufficient flexibility to permit computation of decompression with variation in hypothesis about the fundamental process of decompression. Values computed are compared with results of <u>experimental dives</u> , conducted at <u>HDU</u> , to determine validity of hypotheses under test.					
26. (U) PROGRESS: Program STANDIVE employed to provide theoretical computations to SMRL medical officers. Joint report with CAPT J. Robertson, MC, USNR (Brookhaven) on a program to compute theoretical minimum time continuous ascents in preparation.					
27. COMMUNICATIONS SECURITY <input type="checkbox"/> a. COMSEC OR COMSEC RELATED <input checked="" type="checkbox"/> b. NOT RELATED		28.	29. OSD CODE DT	30. BUDGET CODE 1	
31. MISSION OBJECTIVE GOR 43			32. PARTICIPATION		
33. REQUESTING AGENCY N/A		34. SPECIAL EQUIPMENT N/A			
35. EST. FUNDS (In thousands) N/A		36.			

DD FORM 1498
1 NOV 65

REPLACES EDITION OF 1 AUG 64 WHICH MAY BE USED.

(Items 1 to 26 identical to NASA Form 1122)

Addendum to Work Unit MF022.03.03-9010

1/67-12/67 Publications:

None.

RESEARCH AND TECHNOLOGY RESUME			1.	2. GOVT ACCESSION	3. AGENCY ACCESSION	REPORT CONTROL SYMBOL DD-DR&E(AR)636
4. DATE OF RESUME 31 12 67	5. KIND OF RESUME D. Change 31 12 66	6. SECURITY RPT U WRK	7. REGRADING N/A	8. RELEASE LIMITATION GA	9. LEVEL OF RESUME A. WORK UNIT	
10a. CURRENT NUMBER/CODE 62212012 MF022.03.03-9025			10b. PRIOR NUMBER/CODE SAME			
11. TITLE: (U) Assessment of Factors Related to Submarine Habitability, Escape and Rescue, and New Equipment						
12. SUBJECT TOPIC OR TECH. AREA 016200 Stress physiology 007900 Ind(occup)med 012900 Physiology			13. START DATE 22 09 49	14. CRIT. COMPL. DATE N/A	15. FUNDING AGENCY DNO	
16. PROCURE. METHOD C. In-House	17. CONTRACT/GRANT a. NUMBER: N/A c. TYPE:	a. DATE: d. AMOUNT:	18. RESOURCES EST. PRIOR FY '67 CURRENT FY '68	a. PROFESSIONAL MAN-YEARS 1.3 1.3	b. FUNDS (In thousands) 11 11	
19. GOVT LAB/INSTALLATION/ACTIVITY NAME: Naval Submarine Medical Center ADDRESS: Box 600, NavSubBase Groton, Connecticut 06340 RESP. INDIV.: DUFFNER, G.J., CAPT, MC, USN TEL: 203-449-3261 AUTOVON: 746-3261			20. PERFORMING ORGANIZATION NAME: Military Operations Branch ADDRESS: Submarine Medical Research Lab. INVESTIGATORS PRINCIPAL: Markham, T.N., LCDR, MC, USN ASSOCIATE: TEL: 203-449-3896 AUTO: 746-3896, DN			
21. TECHNOLOGY UTILIZATION Safety measures (SCUBA diving) radiation diving; physiology of diving			22. COORDINATION N/A			
23. KEYWORDS (U) Decompression sickness; pulmonary physiology; radiation effects; tritium; SCUBA diving; closed cabin atmospheres; environmental physiology; submarine personnel						
24. (U) OBJECTIVE: To maintain a continuing work unit which will permit evaluation of products and items of equipment that are offered for improvement of various aspects of submarine habitability and offer an avenue for publication of the series of papers prepared by junior medical officers for fulfillment of that part of the requirements for qualification as Submarine Medical Officers.						
25. (U) APPROACH: Evaluation and testing of new equipment is carried out on operating submarines and in high pressure chambers within the laboratory. Further support is given to studies related to submarine atmosphere control and related closed ecological environments on either an operating ship or under controlled laboratory conditions.						
26. (U) PROGRESS: Studies underway under this work unit include: (1) Nine manually operated, pulmonary resuscitators used aboard submarines for ventilatory capacity and shelf life. Materials in these instruments readily oxidizes on submarines rendering them useless in relatively short periods, (1-2 yrs); (2) Development of a small, high pressure operated aspirators which are not effected by changes in ambient pressure, yet is light and compact; (3) Shipboard analysis of diesel submarine atmospheres to determine if potential hazards exist; (4) Several individual microbiological studies on submarines; (5) Reports in preparation on studies of the pulmonary retention of trace hydrocarbons in submarine atmospheres; (6) Review of report concerning the relationship of atmospheric hydrocarbons and liver function studies.						
27. COMMUNICATIONS SECURITY <input type="checkbox"/> a. COMSEC OR COMSEC RELATED <input checked="" type="checkbox"/> b. NOT RELATED		28.	29. OSD CODE DT		30. BUDGET CODE 1	
31. MISSION OBJECTIVE GOR 43			32. PARTICIPATION DN MDL \$5,000			
33. REQUESTING AGENCY N/A		34. SPECIAL EQUIPMENT N/A				
35. EST. FUNDS (In thousands) CFY+1 N/A		36.				

DD FORM 1498

REPLACES EDITION OF 1 AUG 64 WHICH MAY BE USED.

(Items 1 to 26 identical to NASA Form 1122)

Addendum to Work Unit MF022.03.03-9025

1/67 - 12/67 Publications:

Geer, B. R., A Guide for Conservative Therapy Aboard Fleet Ballistic Missile Submarines, SMRL Special Report No. 67-12, 11 October 1967.

Linaweaver, P. G., (U) Advanced Diving System Trials, SMRL Special Report No. 67-1, 5 January 1967 (Conf.).

Linaweaver, P. G., Toxic Marine Life, Military Medicine, 132:437-442, June 1967.

Publow, D. G., Acute Radiation Injury: A Review of the Pathogenesis, Clinical Course and Treatment for Submarine Personnel, SMRL Special Report No. 67-11, 8 September 1967.

Van Genderen, L., Study of Air Embolism and Extra-Alveolar Accidents Associated with Submarine Escape Training 1956-1966, SMRL Report No. 500, 17 August 1967.

Waite, C. L. et al, Cerebral Air Embolism: I. Basic Studies, SMRL Report No. 493, 18 April 1967.

RESEARCH AND TECHNOLOGY RESUME				2. GOVT ACCESSION		3. AGENCY ACCESSION		REPORT CONTROL SYMBOL DD-DR&E(AR)636	
4. DATE OF RESUME 31 12 67		5. KIND OF RESUME D. Change 31 12 66		6. SECURITY U RPT WRK		7. REGRADING N/A		8. RELEASE LIMITATION GA	
10a. CURRENT NUMBER/CODE 62212012 MF022.03.03-9027		10b. PRIOR NUMBER/CODE 62212012 MF022.03.03-9027							
11. TITLE: (U) Buoyant Free Escape									
12. SCIENTIFIC OR TECH. AREA 006000 Escape, rescue and survival 016200 Stress physiology				13. START DATE 22 09 49		14. CRIT. COMPL. DATE N/A		15. FUNDING AGENCY DNO	
16. PROCURE. METHOD C. In-House		17. CONTRACT/GRANT a. DATE: b. NUMBER: N/A c. TYPE: d. AMOUNT:		18. RESOURCES EST. PRIOR FY '67 CURRENT FY '68		a. PROFESSIONAL MAN-YEARS 3 1.5		b. FUNDS (In thousands) 3 18	
19. GOV'T LAB/INSTALLATION/ACTIVITY NAME: ADDRESS: Naval Submarine Medical Center Box 600, NavSubBase Groton, Connecticut 06340 RESP. INDIV.: DUFFNER, G.J., CAPT, MC, USN TEL: 203-449-3261 AUTOVON: 746-3261				20. PERFORMING ORGANIZATION NAME: ADDRESS: Military Operations Branch Submarine Medical Research Lab. Markham, T.N., LCDR, MC, USN Hall, D.A., LT(JG), MSC, USNR INVESTIGATORS: PRINCIPAL: ASSOCIATE: TEL: 203-449-3896 AUT: 746-3896 TYPE: DN					
21. TECHNOLOGY UTILIZATION Underwater physiology				22. COORDINATION N/A					
23. KEYWORDS (U) Individual escape; sea bottom; depth of 600 feet									
24. (U) OBJECTIVE: To determine the feasibility of individual escape to a depth of 600 feet, utilizing the Steinke Hood and Submarine Escape Suit as the supportive appliances and survival equipment.									
25. (U) APPROACH: To evaluate no-decompression dive profiles to depths of 600 feet, elucidating the inherent problems in the ultra-rapid pressurization of the escape trunk if the no-decompression limits are to be observed. In conjunction with the foregoing, the effect that the Submarine Escape Suit will have on the overall escape procedure relative to suit squeezes, suit blow-ups, increases ascent rates, impediment to escape procedure due to snagging of the suit upon leaving the escape trunk, and the survivability under adverse surface thermal conditions, are being evaluated.									
26. (U) PROGRESS: The British Mark VI and VII Submarine Escape and Immersion Equipment appliances (SEIE) are presently under test to determine their thermal protection after escape from a submarine. When this testing is completed in February 1968, a second phase of the study will commence to determine what modification to existing U.S. Submarine escape trunks will be required to utilize this equipment. The information obtained from the two phases of this study will then be used to adapt the British SEIE to U.S. submarines or to develop a new U.S. prototype to overcome any deficiencies noted in the British SEIE. Further, the preliminary data from the present thermal testing indicates that exercise and activity on the part of the test subjects greatly alters the thermal survival offered by this equipment. If this finding remains in evidence, further studies on the aspect will be conducted within the next year.									
27. COMMUNICATIONS SECURITY <input type="checkbox"/> a. COMSEC OR COMSEC RELATED <input checked="" type="checkbox"/> b. NOT RELATED		28.		29. OSD CODE DT		30. BUDGET CODE 1			
31. MISSION OBJECTIVE GOR 43				32. PARTICIPATION DN DSSP \$15,000					
33. REQUESTING AGENCY N/A		34. SPECIAL EQUIPMENT N/A							
35. EST. FUNDS (In thousands) CFY+1 N/A		36.							

DD FORM 1498

REPLACES EDITION OF 1 AUG 64 WHICH MAY BE USED.

(Items 1 to 26 identical to NASA Form 1122)

Addendum to Work Unit MF022.03.03-9027

1/67-12/67 Publications:

None.

RESEARCH AND TECHNOLOGY RESUME		1.	2. GOVT ACCESSION	3. AGENCY ACCESSION	REPORT CONTROL SYMBOL DD-DR&E(AR)636
4. DATE OF RESUME 31 12 67	5. KIND OF RESUME D.Change 31 12 66	6. SECURITY RPT U WRK	7. REGRADING N/A	8. RELEASE LIMITATION GA	9. LEVEL OF RESUME A-Work Unit
10A. CURRENT NUMBER/CODE 62212012 MF022.03.03-9028		10B. PRIOR NUMBER/CODE 61245012 MR005.04-0050			
11. TITLE: (U) Time-Concentration Exposure Limits of CO2					
12. SCIENTIFIC OR TECH. AREA 012900 Physiology; 005900 Environmental biology		13. START DATE 01 08 67	14. CRIT. COMPL. DATE N/A	15. FUNDING AGENCY DNO 1	
16. PROCURE. METHOD C.In-House	17. CONTRACT/GRANT a. DATE: b. NUMBER: c. TYPE: N/A d. AMOUNT:	18. RESOURCES EST. PRIOR FY '67 CURRENT FY '68	a. PROFESSIONAL MAN-YEARS 1 3.25	b. FUNDS (In thousands) 14.6 59	
19. GOV'T LAB/INSTALLATION/ACTIVITY NAME: Naval Submarine Medical Center ADDRESS: NavSubBase, Groton, Conn. 06340		20. PERFORMING ORGANIZATION NAME: Physiology Branch ADDRESS: Submarine Medical Research Lab			
RESP. INDIV.: DUFFNER, G. J., CAPT MC USN TEL: 203-449-3261 Autovon: 746-3261		INVESTIGATORS PRINCIPAL: Schaefer, K. E., M.D. ASSOCIATE: Carey, C. R. Autovon: 746:3410 TEL: 203-449-3410 TYPE: DN			
21. TECHNOLOGY UTILIZATION Environmental physiology		22. COORDINATION N/A			
23. KEYWORDS (U) CO2 toxicity; acid base balance; electrolyte exchange; lactic dehydrogenase; electron microscopy; metabolic adaptation to CO2					
24. (U) OBJECTIVE: To investigate the influence of adaptation to CO2 as indicated in the compensation of respiratory acidosis on stress response, metabolic alterations, electrolyte exchange, CO2 storage.					
(U) APPROACH: Adrenal cortical and adrenal medullary activity, fat metabolism (triglycerides) and glucose-6-phosphate dehydrogenase activity were determined in guinea pigs exposed for prolonged periods to increased CO2 concentrations.					
(U) PROGRESS: The stress response in chronic hypercapnia was studied in guinea pigs exposed to 15% CO2 in 21% O2 for prolonged periods. Respiratory acidosis was compensated after 3 days of exposure. Adrenal cortical response as measured by a rise of blood corticosteroids, adrenal cholesterol depletion and lymphopenia was limited to the 3-day phase of uncompensated respiratory acidosis. The same was true for adrenal medullary stimulation as indicated by adrenal epinephrine depletion. Intermittent daily 8-hour exposure to 15% CO2 for 7 days neither produced a compensation of the respiratory acidosis nor an abatement of the sympathoadrenal stimulation. These findings indicate that the stress response to CO2 is pH dependent. Changes in fat metabolism (triglycerides) measured so far indicate a similar pH dependence.					
27. COMMUNICATIONS SECURITY <input type="checkbox"/> a. COMSEC OR COMSEC RELATED <input checked="" type="checkbox"/> b. NOT RELATED		28.	29. OSD CODE DT	30. BUDGET CODE 1	
31. MISSION OBJECTIVE GOR 43		32. PARTICIPATION			
33. REQUESTING AGENCY N/A		34. SPECIAL EQUIPMENT N/A			
35. EST. FUNDS (In thousands) CFY+1 N/A		36.			

Addendum to Work Unit MF022.03.03-9028

1/67--12/67 Publications

1. Schaefer, K. E., N. McCabe and J. Withers. Stress response in chronic hypercapnia. Submitted for publication. J. Am. Physiol.
2. Jacey, M. J., and K. E. Schaefer. Regulation of plasma lactic dehydrogenase in chronic respiratory acidosis. Am. J. Physiol. 212(3):859-863, 1967.

RESEARCH AND TECHNOLOGY RESUME		1.		2. GOVT ACCESSION		3. AGENCY ACCESSION		REPORT CONTROL SYMBOL DD-DR&E(AR)636	
4. DATE OF RESUME 31 12 67		5. KIND OF RESUME D.Change 31 12 66		6. SECURITY RPT U WRK		7. REGRADING N/A		8. RELEASE LIMITATION GA	
9. LEVEL OF RESUME A-Work Unit		10. CURRENT NUMBER/CODE 62212012 MF022.03.03-9029		10. PRIOR NUMBER/CODE 61245012 MR005.04-0064		11. TITLE: (U) Effects of Exposure to the Total Atmospheric Environment in Submarines and of Individual Trace Substances in Respiratory Functions			
12. SCIENTIFIC OR TECH. AREA 005900 Environmental biology		13. START DATE 03 65		14. CRIT. COMPL. DATE N/A		15. FUNDING AGENCY DNO			
16. PROCURE. METHOD C.In-House		17. CONTRACT/GRANT a. DATE: b. NUMBER: c. TYPE: N/A d. AMOUNT:		18. RESOURCES EST. PRIOR FY '67 CURRENT FY '68		19. PROFESSIONAL MAN-YEARS .37 .25		20. FUNDS (In thousands) 0.10 2.	
19. GOVT LAB/INSTALLATION/ACTIVITY NAME: Naval Submarine Medical Center ADDRESS: NavSubBase, Groton, Conn. 06340		20. PERFORMING ORGANIZATION NAME: Physiology Branch ADDRESS: Submarine Medical Research Lab		INVESTIGATORS PRINCIPAL: Schaefer, K. E., M.D. ASSOCIATE: Autovon 746-3410 TEL: 203-449-3410 TYPE: DN		RESP. INDIV.: DUFFNER, G. J., CAPT MC USN TEL: 203-449-3261 Autovon 746-3261			
21. TECHNOLOGY UTILIZATION Industrial medicine		22. COORDINATION N/A		23. KEYWORDS (U) Submarine habitability; physiological effects; atmospheric contaminants; submarine atmosphere		24. (U) <u>OBJECTIVE</u> : To determine the physiological effects of atmospheric contaminants in nuclear powered submarines during prolonged exposure.			
(U) <u>APPROACH</u> : Special studies are being carried out to determine adaptive responses to prolonged exposure to 1--1.5% CO ₂ . Measurement of retention of trace contaminants in the respiratory tract of submarine personnel is carried out using a specially designed respiratory mask to collect trace contaminants of the inspired and expired air over sufficient time periods so as to allow subsequent analysis of accumulated trace contaminants by gas chromatography and mass spectrometer analysis.									
(U) <u>PROGRESS</u> : Several studies were carried out by Submarine Medical Officers on CO ₂ effects on acid base balance, respiratory functions, gastric secretion and calcium-phosphorus metabolism while on patrol. Moreover, studies of retention of trace substances were performed on a limited number of subjects during two submarine patrols.									
27. COMMUNICATIONS SECURITY <input type="checkbox"/> 2. CONSEC OR CONSEC RELATED <input checked="" type="checkbox"/> 3. NOT RELATED		28.		29. OSD CODE DT		30. BUDGET CODE 1			
31. MISSION OBJECTIVE GOR 43		32. PARTICIPATION		33. REQUESTING AGENCY N/A		34. SPECIAL EQUIPMENT N/A			
35. EST. FUNDS (In thousands) CPY+1 N/A		36.							

DD FORM 1 NOV 65 1498

REPLACES EDITION OF 1 AUG 64 WHICH MAY BE USED.

(Items 1 to 26 identical to NASA Form 1122)

Addendum to Work Unit MF022.03.93-9029

1/67-12/67 Publications:

None.

RESEARCH AND TECHNOLOGY RESUME		1.	2. GOVT ACCESSION	3. AGENCY ACCESSION	REPORT CONTROL SYMBOL DD-DR&E(AR)636
4. DATE OF RESUME 31 12 67	5. KIND OF RESUME D.Change 31 12 66	6. SECURITY RPT U WRK	7. REGRADING N/A	8. RELEASE LIMITATION GA	9. LEVEL OF RESUME A-Work Unit
10A. CURRENT NUMBER/CODE 62212012 MF022.03.03-9030		10B. PRIOR NUMBER/CODE 61245012 MR005.04-0058			
11. TITLE: (U) Effect of Isolation and Various Work-Rest Cycles on Rhythms of Physiological Functions and Performance					
12. SCIENTIFIC OR TECH. AREA 005900 environmental biology; 016200 stress physiology		13. START DATE 01 08 67	14. CRIT. COMPL. DATE N/A	15. FUNDING AGENCY DNO	
16. PROCEDURE METHOD C.In-House	17. CONTRACT/GRANT a. DATE: b. NUMBER: c. TYPE: N/A d. AMOUNT:	18. RESOURCES EST. a. PRIOR FY '67 b. CURRENT FY '68	19. PROFESSIONAL MAN-YEARS a. 2. b. 3.75		20. FUNDS (in thousands) a. 24 b. 57
19. GOV'T LAB/INSTALLATION/ACTIVITY NAME: Naval Submarine Medical Center ADDRESS: NavSubBase, Groton, Conn. 06340		20. PERFORMING ORGANIZATION NAME: Physiology Branch ADDRESS: Submarine Medical Research Lab			
RESP. INDIV.: DUFFNER, G. J. CAPT MC USN TEL: 203-449-3261 Autovon 746-3261		INVESTIGATORS PRINCIPAL: Schaefer, K. E., M.D. ASSOCIATE: Weybrew, B.B., Ph.D. Autovon 746-3410 TEL: 203-449-3410 TYPE: DN			
21. TECHNOLOGY UTILIZATION undersea warfare Space technology;		22. COORDINATION N/A			
23. KEYWORDS (U) Circadian cycles; confinement; physiological functions; performance levels; adaptability of individual time clocks, work-rest cycles					
24. (U) <u>OBJECTIVE</u> : To determine the effects of isolation in a constant environment and use of various work-rest cycles on circadian cycles of physiological functions and performance levels. (U) <u>APPROACH</u> : Physiological data are collected from subjects during isolation in a constant environment, using 8-channel biotelemetry systems, and evaluated by computer analysis and other analytic methods. (U) <u>PROGRESS</u> : During three isolation experiments in a constant environment lasting for several weeks, respiratory rate was always found to be reduced indicating a stimulating influence of the normal level of sense impressions on respiration. The elimination of environmental 24-hour time givers during isolation in a constant environment resulted in a free running of circadian cycles of sleep-wakefulness which averaged about 25.5 hours. If an approximately normal physical activity level was maintained, the phase shift of most of the physiological functions remained synchronized with the sleep-wakefulness cycle with the exception of the respiratory rate. The recovery period proved to be the most stressful time resulting in an inversion of the normal body temperature cycle with a peak during the sleeping period. Different personality types were found to have a distinct pattern of temporal organization of physiological functions at different levels.					
27. COMMUNICATIONS SECURITY <input type="checkbox"/> COMSEC OR COMSEC RELATED <input checked="" type="checkbox"/> NOT RELATED	28.	29. OSD CODE DT		30. BUDGET CODE 1	
31. MISSION OBJECTIVE GOR 43		32. PARTICIPATION			
33. REQUESTING AGENCY N/A	34. SPECIAL EQUIPMENT N/A				
35. EST. FUNDS (in thousands) CPY+1 N/A	36.				

DD FORM 1 NOV 65 1498

REPLACES EDITION OF 1 AUG 64 WHICH MAY BE USED.

(Items 1 to 26 identical to NASA Form 1122)

Addendum to Work Unit MF022.03.03-9030

1/67--12/67 Publications

1. Schaefer, K. E., B. R. Clegg, C. R. Carey, J. H. Dougherty, Jr. and B. B. Weybrew. Effect of isolation in a constant environment on periodicity of physiological functions and performance levels. Aerospace Medicine, V38(10):1002-1018, October, 1967.

RESEARCH AND TECHNOLOGY RESUME		1.		2. GOVT ACCESSION	3. AGENCY ACCESSION	REPORT CONTROL SYMBOL DD-DR&E(AR)636	
4. DATE OF RESUME 31 12 67	5. KIND OF RESUME D. Change 31 12 66	6. SECURITY U U RPT WRK		7. REGRADING N/A	8. RELEASE LIMITATION GA	9. LEVEL OF RESUME A. Work Unit	
109. CURRENT NUMBER/CODE 62212012 MF 022.03.08-9001				100. PRIOR NUMBER/CODE N/A			
11. TITLE: (U) Bio-Medical Aspects of Naval Laser Applications							
12. SCIENTIFIC OR TECH. AREA 013300 Protective Equip. 007900 Industrial Medicine				13. START DATE 05 65	14. CRIT. COMPL. DATE 12 70	15. FUNDING AGENCY DNO	
16. PROCURE. METHOD C. In-House		17. CONTRACT/GRANT a. DATE: b. NUMBER: N/A c. TYPE: d. AMOUNT:		18. RESOURCES EST. a. PROFESSIONAL MAN-YEARS PRIOR FY 67 1.5 CURRENT FY 68 2		b. FUNDS (in thousands) 10 15	
19. GOV'T LAB/INSTALLATION/ACTIVITY NAME: ADDRESS: Naval Submarine Medical Center Naval Submarine Base Groton, Conn. 06340				20. PERFORMING ORGANIZATION NAME: ADDRESS: Biophysics Branch Submarine Medical Research Lab.			
RESP. INDIV.: DUFFNER, G. J. CAPT MC USN TEL: 203-449-3261 AUTOVON 746-3261				INVESTIGATORS PRINCIPAL: Zglobicki, L.J., LTJG MSC ASSOCIATE: Smithwick, G.A., LTJG MSC TEL: 449-3772 AUTO 746-3772 TYPE: DM			
21. TECHNOLOGY UTILIZATION Laser operations, Safety Standards				22. COORDINATION N/A			
23. KEYWORDS (U) Energy density; Laser radiation; Ocular effects; Pathology							
24. (U) OBJECTIVE: To determine the minimal energy density at several laser radiation wavelengths that will cause damage to the retina and/or other ocular tissues. Secondly, to compare the laser-induced pathology of different laser wavelengths and power levels.							
25. (U) APPROACH: Using laboratory animals, the ocular effects induced by ruby, neodymium, and frequency-doubled neodymium laser radiations will be explored. Induced effects will be documented by photographs, recorded observations, and pathologic sections. Comparisons of the pathology sections of different wavelengths and power levels will be made.							
26. (U) PROGRESS: A report entitled "Laser Induced Pathology of the Rabbit Retina: Comparison at 3 wavelengths" has been written. This report is concerned with the preliminary work under this unit. A literature search has been updated, conferences have been attended and laser installations visited. The investigation has been delayed due to equipment failure.							
27. COMMUNICATIONS SECURITY <input type="checkbox"/> a. COMSEC OR COMSEC RELATED <input checked="" type="checkbox"/> b. NOT RELATED		28.		29. OSD CODE DT		30. BUDGET CODE 1	
31. MISSION OBJECTIVE GOR43				32. PARTICIPATION DN USN/USL, NLON testing facilities, consulting			
33. REQUESTING AGENCY N/A		34. SPECIAL EQUIPMENT N/A					
35. EST. FUNDS (in thousands) N/A		36.					

DD FORM 1 NOV 65 1498

REPLACES EDITION OF 1 AUG 64 WHICH MAY BE USED.

(Items 1 to 26 identical to NASA Form 1122)

Addendum to Work Unit MF022.03.08-9001

1/67-12/67 Publications:

None.

RESEARCH AND TECHNOLOGY RESUME		1.		2. GOVT ACCESSION		3. AGENCY ACCESSION		REPORT CONTROL SYMBOL	
4. DATE OF RESUME		5. KIND OF RESUME		6. SECURITY		7. REGRADING		8. RELEASE LIMITATION	
31 12 67		D.Change 31 12 66		RPT U WRK		N/A		GA	
104. CURRENT NUMBER/CODE		105. PRIOR NUMBER/CODE						9. LEVEL OF RESUME	
61245012		MR005.04-0053		none				A-Work Unit	
11. TITLE:									
(U) Enzymic Responses to Environmental Challenges									
12. SCIENTIFIC OR TECH. AREA				13. START DATE		14. CRIT. COMPL. DATE		15. FUNDING AGENCY	
002300 Biochemistry; 016200 stress physiology				01 01 64		N/A		DNO 1	
16. PROCURE. METHOD		17. CONTRACT/GRANT		18. RESOURCES EST.		a. PROFESSIONAL MAN-YEARS		b. FUNDS (In thousands)	
C. In-House		a. DATE:		PRIOR FY '67		1.25		26	
		b. NUMBER:		CURRENT FY '68		1.25		26	
		c. TYPE: N/A							
19. GOVT LAB/INSTALLATION/ACTIVITY				20. PERFORMING ORGANIZATION					
NAME: Naval Submarine Medical Center				NAME: Physiology Branch					
ADDRESS: NavSubBase, Groton, Conn. 06340				ADDRESS: Submarine Medical Research Lab					
RESP. INDIV: DUFFNER, G. J., CAPT MC USN				INVESTIGATORS Tappan, D. V., Ph.D.					
TEL: 203-449-3261 Autovon 746-3261				PRINCIPAL: Autovon 746-3410					
				ASSOCIATE: Autovon 746-3410					
				TEL: 203-449-3410					
				TYPE: DN					
21. TECHNOLOGY UTILIZATION				22. COORDINATION					
Environmental physiology				N/A					
23. KEYWORDS (U) Enzymes; metabolic adaptation and regulation; carbonic anhydrase; carbon dioxide; isozymes; multiple enzymic activities									
24. (U) OBJECTIVE: To evaluate influences of artificial closed environments, including special gas mixtures and high pressures, on enzymic responses.									
25. (U) APPROACH: Studies at the tissue and enzyme level of biochemical reactions related to, or influenced by, components of submarine or diving atmospheres.									
26. (U) PROGRESS: Work on the tissue carbon dioxide regulating system, the carbonic anhydrase complex, has continued with emphasis placed on the influence of the role of the various enzymes of the system on the regulation of overall activity and control of product accumulation. A study of the effects of carbonic anhydrases on carbon dioxide transport across erythrocyte membranes has been reported. The concept of the application of the kinetic expression describing the carbonic anhydrase reaction at high enzyme concentrations to the analysis of enzyme systems in general at tissue concentrations has been developed. A report on carbonic anhydrase activity has been accepted for publication in Enzymologia.									
27. COMMUNICATIONS SECURITY		28.		29. OSD CODE		30. BUDGET CODE			
<input type="checkbox"/> A. COMSEC OR COMSEC RELATED <input checked="" type="checkbox"/> B. NOT RELATED				AR		1			
31. MISSION OBJECTIVE				32. PARTICIPATION					
GOR 43									
33. REQUESTING AGENCY		34. SPECIAL EQUIPMENT							
N/A		N/A							
35. EST. FUNDS (In thousands)		36.							
CPY: N/A									

DD FORM 1498

REPLACES EDITION OF 1 AUG 64 WHICH MAY BE USED.

(Items 1 to 26 identical to NASA Form 1122)

Addendum to Work Unit MR005.04-0053

1/67--12/67 Publications

1. Tappan, D. V. Simple method for manipulation and repeated sampling from dialysis bags. SMRL Report No. 67-2
3 April 1967.

RESEARCH AND TECHNOLOGY RESUME			1.	2. GOVT ACCESSION	3. AGENCY ACCESSION	REPORT CONTROL SYMBOL DD-DR&E(AR)636	
4. DATE OF RESUME 31 12 67	5. KIND OF RESUME D.Change 31 12 66	6. SECURITY RPT U WKK	7. REGRADING N/A	8. RELEASE LIMITATION GA	9. LEVEL OF RESUME A-Work Unit		
10a. CURRENT NUMBER/CODE 61245012 MRO05.04-0054			10b. PRIOR NUMBER/CODE same				
11. TITLE: (U) Physiological Alterations Occurring in Free Diving							
12. SCIENTIFIC OR TECH. AREA 012900 Physiology; 006000 escape, rescue and survival			13. START DATE 22 09 49	14. CRIT. COMPL. DATE N/A	15. FUNDING AGENCY DNO		
16. PROCURE. METHOD C. In-House		17. CONTRACT/GRANT a. DATE: b. NUMBER: c. TYPE: N/A d. AMOUNT:	18. RESOURCES EST. PRIOR FY '67 CURRENT FY '68	19. PROFESSIONAL MAN-YEARS 1. 1.5		20. FUNDS (In thousands) 29.3 33.	
19. GOV'T LAB/INSTALLATION/ACTIVITY NAME: Naval Submarine Medical Center ADDRESS: NavSubBase, Groton, Conn. 06340			20. PERFORMING ORGANIZATION NAME: Physiology Branch ADDRESS: Submarine Medical Research Lab.				
RESP. INDIV.: DUFFNER, G. J., CAPT MC USN TEL: 203-449-3261 Autovon 746-3261			INVESTIGATORS PRINCIPAL: Schaefer, K. E., M.D. ASSOCIATE: Carey, C. R. Autovon 746-3410 TEL: 203-449-3410 TYPE: DN				
21. TECHNOLOGY UTILIZATION Underwater physiology			22. COORDINATION N/A				
23. KEYWORDS (U) Alveolar pathways; "free" dive; lung-blood CO ₂ gradient; bradycardia; pulmonary gas exchange; submarine escape training							
24. (U) OBJECTIVE: To determine the mechanisms setting physiological limits of breathhold diving and investigate respiratory adaptation in breathhold diving.							
(U) APPROACH: Measurement of alveolar CO ₂ and O ₂ tensions and lung volumes during dives and breathholding to the breaking point at different depths. Determinations of changes in cardiac output and pulmonary blood volume using the impedance plethysmograph.							
(U) PROGRESS: The breathholding breaking point curve in diving was found to deviate greatly from that obtained at the surface. The alveolar pCO ₂ values found at every depth are much lower than those obtained at corresponding pO ₂ values of the standard breathholding breaking point curve at the surface. Lung volume shrinkage is known to shorten the breathholding time at the surface. However, lung volume reduction by compression in diving does not shorten the breathholding time. Contrary, the divers are able to hold their breaths somewhat longer under water. Of the three factors known to determine the breaking point at the surface, two, alveolar CO ₂ tension and lung volume reduction, lose their importance in breathhold diving. Alveolar oxygen tension becomes the dominant single factor determining the end point of breathholding during diving. Measurement of cardiac output during dives to 90 feet showed a decrease in cardiac output.							
27. COMMUNICATIONS SECURITY <input type="checkbox"/> a. COMSEC OR COMSEC RELATED <input checked="" type="checkbox"/> b. NOT RELATED		28.	29. OSD CODE AR		30. BUDGET CODE 1		
31. MISSION OBJECTIVE GOR 43			32. PARTICIPATION				
33. REQUESTING AGENCY N/A		34. SPECIAL EQUIPMENT N/A					
35. EST. FUNDS (In thousands) CFY++ N/A		36.					

DD FORM 1498

1 NOV 66

REPLACES EDITION OF 1 AUG 64 WHICH MAY BE USED.

(Items 1 to 26 identical to NASA Form 1122)

Addendum to Work Unit MR005.04-0054

1/67-12/67 Publications:

None.

RESEARCH AND TECHNOLOGY RESUME		1.	2. GOVT ACCESSION	3. AGENCY ACCESSION	REPORT CONTROL SYMBOL DD-DR&E(AR)636
4. DATE OF RESUME 31 12 67	5. KIND OF RESUME D. Change 31 12 66	6. SECURITY U RPT WRK	7. REGRADING N/A	8. RELEASE LIMITATION GA	9. LEVEL OF RESUME A. WORK UNIT
10a. CURRENT NUMBER/CODE 61245012 MR005.04-0057			10b. PRIOR NUMBER/CODE 61245012 MR005.04-0057		
11. TITLE: (U) Minimal Recompression Oxygen Treatment of Decompression Sickness					
12. SCIENTIFIC OR TECH. AREA 016200 Stress physiology		13. START DATE 19 05 66	14. CRIT. COMPL. DATE N/A	15. FUNDING AGENCY DNO	
16. PROCURE. METHOD C. In-House	17. CONTRACT/GRANT a. NUMBER: N/A c. TYPE: d. AMOUNT:	18. RESOURCES EST. a. PROFESSIONAL MAN-YEARS PRIOR FY '67 0.1 CURRENT FY '68 0.1		b. FUNDS (In thousands) 0 0	
19. GOV'T LAB/INSTALLATION/ACTIVITY NAME: Naval Submarine Medical Center ADDRESS: Box 600, NavSubBase Groton, Connecticut 06340 RESP. INDIV.: DUFFNER, G.J., CAPT, MC, USN TEL: 203-449-3261 AUTOVON: 746-3261		20. PERFORMING ORGANIZATION NAME: Military Operations Branch ADDRESS: Submarine Medical Research Lab. INVESTIGATORS PRINCIPAL: Markham, T.N., LCDR, MC, USN ASSOCIATE: TEL: 203-449-3896 AUT: 746-3896 TYPE: DN			
21. TECHNOLOGY UTILIZATION Hyperbaric oxygen therapy		22. COORDINATION None			
23. KEYWORDS (U) Decompression sickness; dysbarism; diving; recompression; hyperbaric oxygen therapy					
24. (U) <u>OBJECTIVE</u> : The increased efficiency of oxygen breathing under pressure to accomplish successful treatment of manifestations of decompression sickness and air embolism will be extended in the present study to further define the most appropriate regime and to determine any potential limitations of the methods.					
25. (U) <u>APPROACH</u> : Cases of decompression sickness and air embolism presenting for recompression treatment will be selected for use of a minimum pressure oxygen therapy profile in terms of criteria of adequate resolution of manifestations. The results will be compared to past experience with air recompression in similar cases. Adequacy of the method in which oxygen or air is breathed will be assessed in large dogs following pressure exposure and, in some cases, injection of air into the internal carotid artery. The course of bubble resolution in arteries will then be observed through a skull window during recompression in which air or oxygen is breathed.					
26. (U) <u>PROGRESS</u> : The value of the new schedules for the treatment of decompression sickness and air embolism has been well established. In over two hundred clinical trials on cases of decompression sickness, the failure rate of the initial treatment has been less than 1%. Further modifications of the basic schedules have been made for the treatment of air embolism and no failures have been reported in fourteen clinical cases. These schedules have been promulgated for fleet wide use.					
27. COMMUNICATIONS SECURITY <input type="checkbox"/> a. COMSEC OR COMSEC RELATED <input checked="" type="checkbox"/> b. NOT RELATED		28.	29. OSD CODE AR	30. BUDGET CODE 1	
31. MISSION OBJECTIVE GOR 43		32. PARTICIPATION N/A			
33. REQUESTING AGENCY N/A		34. SPECIAL EQUIPMENT N/A			
35. EST. FUNDS (In thousands) CPY+1 N/A		36.			

DD FORM 1498
1 NOV 65

REPLACES EDITION OF 1 AUG 64 WHICH MAY BE USED.

(Items 1 to 26 identical to NASA Form 1122).

Addendum Sheet

Addendum to Work Unit MR005.04-0057

1/67-12/67 Publications:

Goodman, M.W. Minimal-Recompression, Oxygen-Breathing Method for the
Therapy of Decompression Sickness. Proceedings of the Third
Symposium on Underwater Physiology. ed. Lambertsen, C. J., Baltimore:
Williams & Wilkins, 1967, pp. 165-182

RESEARCH AND TECHNOLOGY RESUME			1.	2. GOVT ACCESSION	3. AGENCY ACCESSION	REPORT CONTROL SYMBOL DD-DR&E(AR)636	
4. DATE OF RESUME 31 12 67	5. KIND OF RESUME D.Change 31 12 66	6. SECURITY RPT U WRK	7. REGRADING N/A	8. RELEASE LIMITATION GA	9. LEVEL OF RESUME A-Work Unit		
10a. CURRENT NUMBER/CODE 61245012 MR005.04-0061			10b. PRIOR NUMBER/CODE Same				
11. TITLE: (U) Physiological Significance and Tolerance Limits of Short and Prolonged Exposure to Increased Concentrations of Positive and Negative							
12. SCIENTIFIC OR TECH. AREA 012900 Physiology; 016200 stress physiology			13. START DATE 28 04 58	14. CRIT. COMPL. DATE N/A	15. FUNDING AGENCY DNO 1		
16. PROCURE. METHOD C.In-House	17. CONTRACT/GRANT a. DATE: b. NUMBER: c. TYPE: N/A d. AMOUNT:	18. RESOURCES-EST. PRIOR FY '67 CURRENT FY '68		19. PROFESSIONAL MAN-YEARS .50 .50		20. FUNDS (In thousands) 14.9 15	
19. GOVT LAB/INSTALLATION/ACTIVITY NAME: Naval Submarine Medical Center ADDRESS: NavSubBase, Groton, Conn. 06340			20. PERFORMING ORGANIZATION NAME: Physiology Branch ADDRESS: Submarine Medical Research Lab.				
RESP. INDIV.: DUFFNER, G. J., CAPT MC USN TEL: 203-449-3261 Autovon 746-3261			INVESTIGATORS PRINCIPAL: Schaefer, K. E. M.D. ASSOCIATE: Dougherty, J. H., Jr. Autovon 746-3410 TEL: 203-449-3410 TYPE: DN				
21. TECHNOLOGY UTILIZATION Environmental physiology			22. COORDINATION N/A				
23. KEYWORDS (U) Airions; aerosols; condensation nuclei; ion gradient							
24. (U) OBJECTIVE: To carry out controlled experiments on the physiological effects of ions and aerosols.							
25. (U) APPROACH: Ion aerosol inhalation equipment is used, which allows the inhalation of predetermined ion levels. Effects of inhalation of positive and negative ions on alveolar gas tensions, lung volumes, flow rates and airway resistance are studied in human subjects. The suggested biomedical mechanism underlying air ion actions involving serotonin changes (Krueger) is also under investigation.							
26. (U) PROGRESS: A series of experiments has been started in which human subjects are exposed to medium concentrations of negative and positive ions. Alveolar gas tensions and respiratory minute volume are monitored continuously. Lung volumes, airway resistance and blood serotonin levels are measured before and after exposure. The effect of acute and chronic exposure to 3% and 15% CO ₂ on blood serotonin levels in guinea pigs has been studied as the first phase of investigating the possible biochemical mechanism underlying air ion actions. Changes in blood serotonin levels were observed under 15% CO ₂ . In the second phase of this study positive ions will be added to the CO ₂ exposure mixtures.							
27. COMMUNICATIONS SECURITY <input type="checkbox"/> a. COMSEC OR COMSEC RELATED <input checked="" type="checkbox"/> b. NOT RELATED		28.		29. OSD CODE AR		30. BUDGET CODE 1	
31. MISSION OBJECTIVE GOR 3				32. PARTICIPATION			
33. REQUESTING AGENCY N/A		34. SPECIAL EQUIPMENT N/A					
35. EST. FUNDS (In thousands) CPY:1 N/A		36.					

DD FORM 1498
1 NOV 65

REPLACES EDITION OF 1 AUG 64 WHICH MAY BE USED.

(Items 1 to 26 identical to NASA Form 1122)

Addendum to Work Unit MR005.04-0061

1/67-12/67 Publications:

None.

RESEARCH AND TECHNOLOGY RESUME				1.	2. GOVT ACCESSION	3. AGENCY ACCESSION	REPORT CONTROL SYMBOL DD-DR&E(AR)636
4. DATE OF RESUME 31 12 67	5. KIND OF RESUME D. Change 31 12 66	6. SECURITY RPT U WRK	7. REGRADING N/A	8. RELEASE LIMITATION GA	9. LEVEL OF RESUME A. WORK UNIT		
10a. CURRENT NUMBER/CODE 61245012 MR005.04-0062				10b. PRIOR NUMBER/CODE 61245012 MR005.04-0062			
11. TITLE (U) Bone Changes in Diving Personnel Not Related to Clinical Decompression Sickness							
12. SUBJECT AREA 067900 Industrial (occup) medicine 012400 Pers. Sel. & Maint. (medical)				13. START DATE 09 65	14. CRIT. COMPL. DATE N/A	15. FUNDING AGENCY DNO	
16. PROCEDURE METHOD C. In-House	17. CONTRACT/GRANT a. DATE: b. NUMBER: N/A c. TYPE: d. AMOUNT:			18. RESOURCES EST. PRIOR FY '67 CURRENT FY '68	19. PROFESSIONAL MAN-YEARS .25 .1		20. FUNDS (In thousands) 4 0
19. GOV'T LAB/INSTALLATION/ACTIVITY NAME: ADDRESS: Naval Submarine Medical Center Box 600, NavSubBase Groton, Connecticut 06340 RESP. INDIV.: DUFFNER, G.J., CAPT, MC, USN TEL: 203-449-3261 AUTOVON: 746-3261				20. PERFORMING ORGANIZATION NAME: ADDRESS: Military Operations Branch Submarine Medical Research Lab. INVESTIGATORS PRINCIPAL: Markham, T.N., LCDR, MC, USN ASSOCIATE: TEL: 203-449-3896 AUT: 746-3896 TYPE: DN			
21. TECHNOLOGY UTILIZATION Commercial diving, hyperbaric medicine				22. COORDINATION None			
23. KEYWORDS (U) Diving, prolonged, comparison, radiographic bone islands, autopsy							
24. (U) OBJECTIVE: To determine if "bone lesions" or "artifacts" that have shown up on examination of a number of diving personnel are related to diving or working under increased ambient pressures. To further determine the potential or actual ill effects on personnel involved in saturation/excursion diving operations over a prolonged period of time.							
25. (U) APPROACH: To conduct a comparison study of all Man-in-the-Sea divers and more randomly selected professional naval or civilian divers with varying experience with an equal number of males randomly selected from the general population. This study would primarily be radiographic comparison of the joint areas and long bones. Should the study reveal significant differences, further pursuit of the objective will be undertaken. This would involve the collection of autopsy material from divers and the establishment of entrance examinations for diving duty, and periodic follow-ups for comparison. Careful computation of historical data will be maintained. All files and data will be retained at SMRL to assure continuity.							
26. (U) PROGRESS: All SeaLab III personnel have been screened for prior diving casualties by reviewing all Form 816's over the past 10 years. A schedule for pre and post exposure x-ray examination of these personnel has been submitted and approved by DSSPTO. The pre-exposure films have been completed. The conclusion of this study awaits the completion of SeaLab III. At that time all diving personnel participating in the SeaLab will have a long bone, x-ray survey made. These new films will then be compared with the pre-exposure series.							
27. COMMUNICATIONS SECURITY <input type="checkbox"/> a. COMSEC OR COMSEC RELATED <input checked="" type="checkbox"/> b. NOT RELATED		28.		29. OSD CODE AR		30. BUDGET CODE 1	
31. MISSION OBJECTIVE GOR 43				32. PARTICIPATION N/A			
33. REQUESTING AGENCY N/A		34. SPECIAL EQUIPMENT N/A					
35. EST. FUNDS (In thousands) CFY: N/A		36.					

DD FORM 1498

REPLACES EDITION OF 1 AUG 64 WHICH MAY BE USED.

(Items 1 to 26 identical to NASA Form 1122)

Addendum Sheet

Addendum to Work Unit MR005.04-0062

1/67-12/67 Publications.

None

RESEARCH AND TECHNOLOGY RESUME		1.	2. GOVT ACCESSION	3. AGENCY ACCESSION	REPORT CONTROL SYMBOL
					DD-DR&E(AR)636
4. DATE OF RESUME	5. KIND OF RESUME	6. SECURITY	7. REGRADING	8. RELEASE LIMITATION	9. LEVEL OF RESUME
31 12 67	D.Change 31 12 66	RPT U WRK	N/A	GA	A.Work Unit
10a. CURRENT NUMBER/CODE		10b. PRIOR NUMBER/CODE			
61245012 MR005.04-0063		same			
11. TITLE: (U) Excursion Dives from the Gas-Saturated State at Depth (Animals/Humans)					
12. SCIENTIFIC OR TECH. AREA		13. START DATE	14. CRIT. COMPL. DATE	15. FUNDING AGENCY	
00600 escape & survival; 012900 physiology; stress physiology; 016200		01 01 65	N/A	DNO	
16. PROCURE. METHOD	17. CONTRACT/GRANT	18. RESOURCES EST.	19. PROFESSIONAL MAN-YEARS	20. FUNDS (In thousands)	
	a. NUMBER:	PRIOR FY	.5	13	
	b. TYPE: N/A	CURRENT FY	.75	19	
19. GOVT LAB/INSTALLATION/ACTIVITY		20. PERFORMING ORGANIZATION			
NAME: Naval Submarine Medical Center		NAME: Physiology Branch			
ADDRESS: NavSubBase, Groton, Conn. 06340		ADDRESS: Submarine Medical Research Lab.			
RESP. INDIV.: DUFFNER, G. J., CAPT MC USN		INVESTIGATORS: Marlham, T.N., LCDR MC USN			
TEL: 203-449-3261 Autovon 746-3261		PRINCIPAL: Schaefer, K. E., M.D.			
		ASSOCIATE: Autovon 746-3410			
		TEL: 203-449-3410 TYPE: DN			
21. TECHNOLOGY UTILIZATION		22. COORDINATION			
Man-in-the-sea; Undersea exploration		N/A			
23. KEYWORDS					
(U) Excursion dives; gas saturation; man-in-the-sea divers					
24. (U) OBJECTIVE: To establish decompression schedules and physiological limitations for excursion dives from the gas-saturated state at depth.					
(U) APPROACH: A series of saturation-excursion dives were carried out with human subjects and measurements were made of alveolar gas tension, lung functions, blood and urine chemistry.					
(U) PROGRESS: The metabolic response to acute increase in pressure (no-decompression dives to 135 feet) as well as to excursion dives following 24-hour saturation at 35 feet was found to be dependent on diurnal cycles. There was a significant increase in plasma lactic dehydrogenase activity and related marked increases of lactate/pyruvate ratio when the dives were made at midnight during the descending phase of the blood lactic dehydrogenase cycle. However, no response was observed either in LDH or lactate/pyruvate ration when the dives were performed at 8:00 AM during the ascending phase of the LDH cycle. These findings indicate the need for a careful scheduling of saturation-excursion dives to avoid metabolic stress effects. Two reports have been completed and accepted for publication in <u>Aerospace Medicine</u>					
27. COMMUNICATIONS SECURITY		28.	29. OSD CODE	30. BUDGET CODE	
<input type="checkbox"/> a. CONSEC OR CONSEC RELATED <input checked="" type="checkbox"/> b. NOT RELATED			AR	1	
31. MISSION OBJECTIVE		32. PARTICIPATION			
GOR 43		DN SUPSAL \$4,000.			
33. REQUESTING AGENCY		34. SPECIAL EQUIPMENT			
N/A		N/A			
35. EST. FUNDS (In thousands)		36.			
N/A					
CFY+1					

DD FORM 1498

REPLACES EDITION OF 1 AUG 64 WHICH MAY BE USED.

(Items 1 to 26 identical to NASA Form 1122)

Addendum to Work Unit MR005.04-0063

1/67-12/67 Publications:

None.

RESEARCH AND TECHNOLOGY RESUME				1.	2. GOVT ACCESSION	3. AGENCY ACCESSION	REPORT CONTROL SYMBOL DD-DR&E(AR)636
4. DATE OF RESUME 31 12 67	5. KIND OF RESUME D. Change 31 12 66	6. SECURITY RPT U WRK	7. REGRADING N/A	8. RELEASE LIMITATION GA	9. LEVEL OF RESUME A. WORK UNIT		
10a. CURRENT NUMBER/CODE 61245012 MR005.19-6024				10b. PRIOR NUMBER/CODE 62212012 MF022.03.03-9001			
11. TITLE: (U) Effect of Stresses of Submarine Service on Oral Health							
12. SCIENTIFIC OR TECH. AREA 017100 Weapons Effects 005900 Environmental Biology 012400 Personnel Selection and Maintenance (medical)				13. START DATE 02 51	14. CRIT. COMPL. DATE N/A	15. FUNDING AGENCY DN-other,	
16. PROCURE. METHOD C. In-House	17. CONTRACT/GRANT a. DATE: b. NUMBER: N/A c. TYPE: d. AMOUNT:			18. RESOURCES EST. PRIOR FY 67 CURRENT FY 68	a. PROFESSIONAL MAN-YEARS .8 .5	b. FUNDS (In thousands) 7 4	
19. GOV'T LAB/INSTALLATION/ACTIVITY NAME: Naval Submarine Medical Center ADDRESS: NavSubBase, Groton, Conn., 06340 RESP. INDIV.: DUFFNER, G. J., CAPT MC USN TEL: 203-449-3261 AUTOVON: 746-3261				20. PERFORMING ORGANIZATION NAME: Dental Branch ADDRESS: Submarine Medical Research Lab INVESTIGATORS PRINCIPAL: SHILLER, W. R., CDR, DC, USN ASSOCIATE: TEL: 203-449-3364 AUTO: 746-3364 TYPE: DN			
21. TECHNOLOGY UTILIZATION Dentistry				22. COORDINATION N/A			
23. KEYWORDS (U) Epidemiology, periodontal health, dental caries, dental barotrauma, dental occlusion, saliva, calculus, dietary studies, taste, atmospheric effects							
24. (U) OBJECTIVE: The aim of this work is to determine what influence submarine service has on oral health, what standards of oral health are necessary in submarine personnel and to determine to what extent oral diseases may influence the effectiveness of submarine personnel. The final result desired is to delineate the dental problems which exist so that necessary measures of personnel selection, clinical preventive dentistry or other treatment may be instituted to eliminate or treat these ill effects.							
25. (U) APPROACH: Epidemiological surveys of submariners to evaluate periodontal health and dental caries status of various phases of their training and service. Dietary studies, including questionnaires and taste change analyses. Case histories and examinations of personnel experiencing dental barotrauma during submarine training pressure tests. Study effects of FBM patrol on parotid salivary components. Standardized collection of parotid saliva and evaluation of physiological correlates. Evaluate calculus formation rate and chemical composition in submarine personnel. Calculus collected by standardized foil technique. Atmospheric effects on oral fluids, tissue and general oral health.							
26. (U) PROGRESS: 1 Jan 1967 - 31 Dec 1967. Analysis of dental problems on FBM patrol reveals about three cases per patrol. The medical officer is able to care adequately for these. Short term inhalation of 4.8% CO ₂ found to have little effect on parotid HCO ₃ when fine requirements of flow rate control are met. Dental calculus formation rate and composition found to be unaffected by an FBM patrol when measured by the Mylar foil technique. It is planned to terminate this work unit and combine efforts in this area with those of a similar work unit (MR005.19-6025) into a new work unit titled, Studies of Oral Health and Environmental Factors in Military Populations.							
27. COMMUNICATIONS SECURITY <input type="checkbox"/> a. COMSEC OR COMSEC RELATED <input checked="" type="checkbox"/> b. NOT RELATED		28.		29. OSD CODE AR		30. BUDGET CODE I	
31. MISSION OBJECTIVE GOR 43				32. PARTICIPATION			
33. REQUESTING AGENCY N/A		34. SPECIAL EQUIPMENT N/A					
35. EST. FUNDS (In thousands) CFY-11 N/A		36.					

DD FORM 1498

1 NOV 65

REPLACES EDITION OF 1 AUG 64 WHICH MAY BE USED.

(Items 1 to 26 identical to NASA Form 1122)

Addendum to Work Unit MR005.19-6024

1/67-12/67 Publications:

Shiller, W. R. Incidence of Dental Problems and Their Management on FBM Submarine Patrols. SMRL Memo Rept. 67-4, 17 April 1967.

Shiller, W. R. Oral Health of Operating Fleet Ballistic Missile Submarine Crews: A Cross-Sectional Survey. SMRL Memo Rept. 67-6, 25 July 1967.

Shiller, W. R. Emergency Dental Treatments by Medical Officers on Isolated Duty, an instruction manual. Submarine Medical Center, August 1967.

Ross, W. A. J. Salivary Bicarbonate Secretion During a Short Term Acute Exposure to CO₂. Thesis for qualification as submarine medical officer. Submarine Medical Center, 15 Nov 1967.

Plebenga, L. W. Dental Calculus Formation Rate in a Submarine Environment. Thesis for qualification as submarine medical officer. Submarine Medical Center, 4 April 1967.

RESEARCH AND TECHNOLOGY RESUME				1. GOVT ACCESSION	2. AGENCY ACCESSION	REPORT CONTROL SYMBOL
4. DATE OF RESUME 31 12 67	5. KIND OF RESUME D. Change 31 12 66	6. SECURITY RPT U WRK	7. REGRADING N/A	8. RELEASE LIMITATION GA	9. LEVEL OF RESUME A. WORK UNIT	
10a. CURRENT NUMBER/CODE 61245012 MRO05.19-6025			10b. PRIOR NUMBER/CODE 62212012 MF022.03.03-9002			
11. TITLE: (U) Study of Oral Health in the Antarctic						
12. SCIENTIFIC OR TECH. AREA 016200 Stress Physiology 005900 Envir. Biology 012400 Pers Sel&Maint.			13. START DATE 11 55	14. CRIT. COMPL. DATE N/A	15. FUNDING AGENCY DN-other	
16. PROCURE. METHOD C. In-House	17. CONTRACT/GRANT a. NUMBER: N/A c. TYPE:	a. DATE: d. AMOUNT:	18. RESOURCES EST. PRIOR FY 67 CURRENT FY 68	a. PROFESSIONAL MAN-YEARS .8 .8	b. FUNDS (in thousands) 1 1	
19. GOV'T LAB/INSTALLATION/ACTIVITY NAME: Naval Submarine Medical Center ADDRESS: NavSubBase, Groton, Conn., 06340 RESP. INDIV.: DUFFNER, G. J., CAPT MC USN TEL: 203-449-3261 AUTOVON: 746-3261			20. PERFORMING ORGANIZATION NAME: Dental Branch ADDRESS: Submarine Medical Research Lab INVESTIGATORS PRINCIPAL: SHILLER, W. R., CDR DC USN ASSOCIATE: TEL: 203-449-3364 AUTO: 746-3364 TYPE: DN			
21. TECHNOLOGY UTILIZATION Dentistry, Public Health			22. COORDINATION N/A			
23. KEYWORDS (U) Epidemiological survey, periodontal disease, dental caries, oral hygiene, personnel selection, saliva, stress, preventive dentistry						
24. (U) OBJECTIVE: To delineate those factors in the Antarctic environment which may effect the oral health of military personnel. To evaluate methods of maintaining good oral health, particularly periodontal health, among Antarctic personnel. To study the effects of <u>stress</u> (specific and non-specific) on the physiology of Antarctic personnel.						
25. (U) APPROACH: Epidemiological surveys of periodontal disease, dental caries, and other oral pathological conditions among Antarctic personnel. Personnel selection and maintenance studies conducted by means of detailed evaluation of oral conditions of personnel before departure to Antarctica. Detailed histories are kept to determine conditions which lead to dental problems in Antarctica and to give some idea of the predictability of dental problems in an isolated military population. Evaluation of preventive dentistry methods, including stannous fluoride applications. Evaluation of Antarctic environment on oral acidogenic microorganisms and dental calculus formation.						
26. (U) PROGRESS: 1 Jan 1967 - 31 Dec 1967. Dental calculus formation rates measured during Antarctic year by two methods. A slight but non-significant increase was noted as the winter progressed. In order to simplify administration, it is planned to terminate this work unit and combine efforts in this area with similar efforts of work unit MRO05.19-6024 into a new work unit titled, Studies of Oral Health and Environmental Factors in Military Populations. A presentation titled "Effects of Ambient Temperature on the Oral Acidogenic Bacteria" was made at International Association for Dental Research in March 1967 by LT P. Kasenchak and CDR W. R. Shiller.						
27. COMMUNICATIONS SECURITY <input type="checkbox"/> a. COMSEC OR COMSEC RELATED <input checked="" type="checkbox"/> b. NOT RELATED		28.	29. OSD CODE AR		30. BUDGET CODE 1	
31. MISSION OBJECTIVE GOR 43			32. PARTICIPATION			
33. REQUESTING AGENCY N/A		34. SPECIAL EQUIPMENT N/A				
35. EST. FUNDS (in thousands) N/A		36.				

DD FORM 1 NOV 65 1498

REPLACES EDITION OF 1 AUG 64 WHICH MAY BE USED. (Items 1 to 26 identical to NASA Form 1122)

Addendum to Work Unit MR005.19-6025

1/67-12/67 Publications:

None.

RESEARCH AND TECHNOLOGY RESUME		1.	2. GOVT ACCESSION	3. AGENCY ACCESSION	REPORT CONTROL SYMBOL DD-DR&E(AR)636
4. DATE OF RESUME 31 12 67	5. KIND OF RESUME D. Change 31 12 66	6. SECURITY RPT U WRK	7. REGRADING N/A	8. RELEASE LIMITATION GA	9. LEVEL OF RESUME A. WORK UNIT
10a. CURRENT NUMBER/CODE 61245012 MR005.19-6026		10b. PRIOR NUMBER/CODE 62212012 MF022.03.03-9003			
11. TITLE: (U) Clinical Evaluation of Stannous Fluoride in Preventive Dentistry					
12. SCIENTIFIC OR TECH. AREA 003500 Clinical Medicine 012400 Personnel Selection&Maint (medical)		13. START DATE 05 61	14. CRIT. COMPL. DATE N/A	15. FUNDING AGENCY DN-other	
16. PROCURE. METHOD C. In-House	17. CONTRACT/GRANT a. DATE: b. NUMBER: N/A c. TYPE: d. AMOUNT:	18. RESOURCES EST. PRIOR FY 67 CURRENT FY 68	a. PROFESSIONAL MAN-YEARS .5 .1	b. FUNDS (In thousands) .2 1.0	
19. GOVT LAB/INSTALLATION/ACTIVITY NAME: Naval Submarine Medical Center ADDRESS: NavSubBase, Groton, Conn., 06340		20. PERFORMING ORGANIZATION NAME: Dental Branch ADDRESS: Submarine Medical Research Lab INVESTIGATORS PRINCIPAL: SCOLA, F. P., CAPT, DC, USN ASSOCIATE: TEL: 203-449-3384 AUTO: 746-3384 TYPE: DN			
21. TECHNOLOGY UTILIZATION Preventive Dentistry		22. COORDINATION N/A			
23. KEYWORDS (U) Preventive dentistry, SnF ₂ , topical application, controlled test population (submarine)					
<p>24. (U) OBJECTIVE: Studies were undertaken to obtain valid statistical evidence of the efficacy of <u>stannous fluoride topically applied</u>, in three treatment methods as a <u>preventive dentistry measure</u>. Should this treatment method reduce the incidence of caries and inhibit the progress of existing caries, its application, service-wide, would enable the Dental Corps to more adequately render complete dental service to all naval personnel. Such findings could also find application in the preventive dentistry field outside the military.</p> <p>(U) APPROACH: Sailor subjects, 17-25 years of age, are randomly assigned to five experimental and one control group. Each group receives a scaling, prophylaxis, an aqueous topical application, and a dentifrice for home use. Stannous fluoride, varying with the treatment method, is applied to all groups except the control group.</p>					
<p>25. (U) PROGRESS: 1 Jan 1967 - 31 Dec 1967. Final analyses being performed for all aspects of the study. Preliminary analysis of the two year data reveals significant benefit from the fluoride applications.</p>					
27. COMMUNICATIONS SECURITY <input type="checkbox"/> a. CONSEC OR CONSEC RELATED <input checked="" type="checkbox"/> b. NOT RELATED		28.	29. OSD CODE AR	30. BUDGET CODE 1	
31. MISSION OBJECTIVE GOR 43		32. PARTICIPATION			
33. REQUESTING AGENCY N/A		34. SPECIAL EQUIPMENT N/A			
35. EST. FUNDS (In thousands) CFY+1 N/A		36.			

DD FORM 1498
1 NOV 65

REPLACES EDITION OF 1 AUG 64 WHICH MAY BE USED.

(Items 1 to 26 identical to NASA Form 1122)

Addendum to Work Unit MR005.19-6026

1/67-12/67 Publications:

Scola, F. P. and Ostrom, C. A. Clinical Evaluation of Stannous Fluoride When Used as a Constituent of a Compatible Prophylactic Paste, as a Topical Solution and in a Dentifrice in Naval Personnel. I. Report of Finding After One Year. J. Am. Dent. Assoc. 73:1306-1311, Dec 1966.

RESEARCH AND TECHNOLOGY RESUME		1.	2. GOVT ACCESSION	3. AGENCY ACCESSION	REPORT CONTROL SYMBOL DD-DR&E(AR)636
4. DATE OF RESUME 31 12 67	5. KIND OF RESUME D. Change 31 12 66	6. SECURITY RPT U WRK	7. REGRADING N/A	8. RELEASE LIMITATION GA	9. LEVEL OF RESUME A. WORK UNIT
104. CURRENT NUMBER/CODE 61245012 MR005.19-6027		105. PRIOR NUMBER/CODE None			
11. TITLE: (U) Self-Preparation for SnF ₂ Therapy in Preventive Dentistry					
12. SCIENTIFIC OR TECH. AREA 003500 Clinical Medicine 012400 Personnel Selection & Maint(medical)		13. START DATE 01 65	14. CRIT. COMPL. DATE N/A	15. FUNDING AGENCY DN-other	
16. PROCURE. METHOD C. In-House	17. CONTRACT/GRANT a. NUMBER: N/A c. TYPE:	18. RESOURCES EST. PRIOR FY 67 CURRENT FY 68	a. PROFESSIONAL MAN-YEARS .5 .9	b. FUNDS (In thousands) 6.8 7.0	
19. GOV'T LAB/INSTALLATION/ACTIVITY NAME: Naval Submarine Medical Center ADDRESS: NavSubBase, Groton, Conn., 06340		20. PERFORMING ORGANIZATION NAME: Dental Branch ADDRESS: Submarine Medical Research Lab INVESTIGATORS PRINCIPAL: SCOLA, F. P., CAPT DC USN ASSOCIATE: TEL: 203-449-3384 AUTO: 746-3384 TYPE: DN			
21. TECHNOLOGY UTILIZATION Preventive Dentistry		22. COORDINATION N/A			
23. KEYWORDS (U) Preventive dentistry, stannous fluoride, prophylaxis, topical application, controlled test population (submarine)					
24. (U) OBJECTIVE: The objective of this study is to test the cariostasis obtained from a self-applied SnF ₂ prophylaxis technique as compared with an operator-applied SnF ₂ prophylaxis technique as part of the "three agent" treatment method in preventive dentistry. MR005.19-6026, now being completed, has established the anticaries effectiveness of the operator-applied SnF ₂ prophylaxis technique. Should the self-applied technique prove sufficiently effective, the resultant reduction in treatment time expended would enable the Dental Corps to administer this preventive measure to all naval personnel with no reduction in other treatment measures currently being accomplished.					
25. (U) APPROACH: Subjects are USN enlisted men, under 22 years, with no previous topical SnF ₂ experience. Clinical examinations, augmented by bite-wing radiographs, are conducted initially and at six month intervals for two years, by the same examiner, employing a double blind technique. The topical applications are applied annually. Two hundred, (1000 in all), are assigned randomly by age and previous caries experience into each of three experimental and two control groups. Group A receives the total SnF ₂ treatment; i.e., 8.9% SnF ₂ in a prophylaxis paste, operator applied; 15 second 10% aqueous SnF ₂ topical, operator applied; and a dentifrice for home use containing 0.4% SnF ₂ . Group B receives the same treatment as Group A minus the SnF ₂ . Group C receives the same treatment as Group A except that the prophylaxis is self-applied. Group D receives the same treatment as Group C minus the SnF ₂ . Group E receives the same treatment as Group C minus the interproximal taping with dental floss.					
26. (U) PROGRESS: 1 Jan 1967 - 31 Dec 1967. Analysis of caries increments of those					
27. COMMUNICATIONS SECURITY <input type="checkbox"/> * COMSEC OR COMSEC RELATED <input checked="" type="checkbox"/> b. NOT RELATED		28.	29. OSD CODE AR	30. BUDGET CODE 1	
31. MISSION OBJECTIVE GOR 43		32. PARTICIPATION			
33. REQUESTING AGENCY N/A		34. SPECIAL EQUIPMENT N/A			
35. EST. FUNDS (In thousands) N/A CFY+1		36.			

DD FORM 1498
NOV 66

REPLACES EDITION OF 1 AUG 64 WHICH MAY BE USED.

(Items 1 to 26 identical to NASA Form 1122)

Addendum to Work Unit MR005.19-6054

1/67-12/67 Publications:

None.

UNCLASSIFIED

Security Classification

DOCUMENT CONTROL DATA - R & D		
<i>(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)</i>		
1. ORIGINATING ACTIVITY (Corporate author) U.S. Naval Submarine Medical Center, Submarine Medical Research Laboratory		2a. REPORT SECURITY CLASSIFICATION Unclassified
		2b. GROUP
3. REPORT TITLE Annual Report of Progress Summaries		
4. DESCRIPTIVE NOTES (Type of report and inclusive dates) Annual Report for calendar year 1967		
5. AUTHOR(S) (First name, middle initial, last name) Jessie W. Kohl, Editor		
6. REPORT DATE 2 January 1968	7a. TOTAL NO. OF PAGES 56	7b. NO. OF REFS none
8a. CONTRACT OR GRANT NO.	9a. ORIGINATOR'S REPORT NUMBER(S) SPECIAL REPORT NO. 68-2	
b. PROJECT NO.		
c.	9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)	
d.		
10. DISTRIBUTION STATEMENT This document has been approved for public release and sale; its distribution is unlimited.		
11. SUPPLEMENTARY NOTES		12. SPONSORING MILITARY ACTIVITY U.S. Naval Submarine Medical Center Box 600, Naval Submarine Base Groton, Connecticut 06340
13. ABSTRACT This report consists of a compilation of the Research and Technology Resume, DD Form 1498 reporting progress on 28 Bureau of Medicine and Surgery Work Units assigned to the Submarine Medical Research Laboratory at the Submarine Medical Center for the calendar year 1967. For each Work Unit there is a description of its <u>Objective</u> , the <u>Approach</u> , and the <u>Progress</u> during the year 1967, and there is a listing of any publications completed during the year.		

DD FORM 1 NOV 65 1473 (PAGE 1)

S/N 0101-807-6801

Unclassified

Security Classification

3ND PPSO 13152

Unclassified

Security Classification

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Submarine medicine						
Underwater physiology						
Submarine selection						
Psychiatric screening for submarine duty						
Weapon System Effectiveness - submarine						
Team interaction in submarines						
Underwater communications						
Acoustic trauma						
Undersea behavioral systems						
Enzymic activities						
Hyperbaric oxygen therapy						
Decompression sickness						
Periodontal health						
Dental barotrauma						
Preventive dentistry						
Vision underwater						

Unclassified

Security Classification